

Martin Černohorský: Science, Reason, and Passion in the Struggle for Freedom

An Oral History with

Martin Černohorský

Students/ Mentees:

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Interviews conducted in 2018 and 2019 by Paul Burnett for the Burnett Research Group, LLC,
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Preface to the Interviews

This project, an oral history of Czech physics from the end of World War II until the fall of communism, came about through a growing public interest in the life history of Georg Placzek, a Czech physicist whose full contributions to theoretical and experimental physics, including his work for the Manhattan Project, have only recently been documented and celebrated in the Czech Republic. In 2005, a symposium on Placzek's achievements in physics was organized in Brno by physicists Martin Černohorský and Marie Fojtíková. One of the speakers and special guests of the conference was F. Anthony (Tony) Placzek, George Placzek's nephew, an American who had already begun his own odyssey to understand the extraordinary story of his family's history in Czechoslovakia. Over the years of his collaboration with Martin and Marie, Tony grew interested in Czech education, and decided to found a scholarship in physics in the name of his uncle George. At the same time as he researched his family's story, he became fascinated by the extraordinary life and achievements of his friend Martin, manifested in part through his many accomplished students and mentees.

Initially, this project began as biography, but very quickly evolved into an exploration of how a scientific community functions under totalitarianism. Are there values in science — a belief in truth outside of politics, internationalism, communalism — that cause some scientists to chafe under the constraints of a succession of political orders — from the Nazi Protektorat to the communist regime to the post-Velvet Revolution global market order? How did scientists, understood as a community rather than individual actors, cope with these changes in society?

What emerges from these interviews above all is a deep passion for education and freedom. There is discipline, wonder, passion, agony, communing with the ancestors, and transcendence in the science they pursued. The spiritual is a theme in these stories. There is a devotion to the beauty and symmetry of physical processes and their measurement, a devotion to the stars and the invisible mechanics of matter and energy. Science became a refuge for these scientists in a world in which the surreal political framework of Marxism-Leninism claimed science itself as its method for determining the destiny of the Czech people.

Although these stories are about science and politics, there are tantalizing revelations of the meaning of their work and their devotion to one another. There are single statements in these stories that are worthy of an entire novel: "And if you live in a totalitarian system, in small towns it is much worse than in large towns, you know, because they have you in their power." The people interviewed for this volume witnessed the ways in which war and geopolitical tensions raised the stakes for routine participation in the basic activities of modern life: gaining access to an education, housing, credentials, and a fair chance for a career in one's chosen calling. A deep and total system of state surveillance dictated what could and could not be said in public, and vocal and serious affirmations of state ideology were the minimum prerequisites for a tolerable life under communism. A moment's indiscretion, such as attending a religious funeral of a friend, for example, might cost you your career, or your children's education. Imagine pursuing your life's passion, knowing that arbitrary punishments and exclusion had befallen friends, neighbors, and family members, and being asked to affirm that this was a good system and a good society, the only possible path.

These interviews, then, focus on the strange case of a man who would not bend to this system. Černohorský's life story is one of repeated moments of assistance from those who recognized his talents, his work ethic, and his unshakeable sense of responsibility to his family and fellow citizens. On the other hand, his life is also a model of independence, wrought from a series of exclusions and forms of self-imposed exile. He had seen empires and total solutions come and go; he wanted to study, and to teach; to receive, and to give back. Amidst the horror of mid-twentieth century Europe, Černohorský clung to the unerring purity of the natural order. He managed for the most part to stay out of the public ideological struggles, but quietly fought for spaces for likeminded souls who sought a refuge from dogma. His almost monastic asceticism and commitment to scientific truth made him, ironically, a romantic figure in a time of compromise, moral ambiguity, and conformity, becoming much more than a mentor for generations of students and colleagues.

It is hoped that these stories will provide some record of a particular kind of life in this part of the world during the twentieth century, and as some examples of how to live a meaningful life in any place and at any time.

Paul Burnett, Berkeley, CA, 2021



Left to right: Ludvík Kunz, Marie Fojtíková, Martin Černohorský, Tony (F.A.) Placzek, Paul Burnett, Jiří Komrská, Brno, 2019. Photo courtesy of Marie Fojtíková. Jiří Grygar interviewed in Prague.

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Martin Černohorský, Brno, 2018

Biography

Dr. Martin Černohorský is emeritus Professor of Physics at Masaryk University. Born in 1923, he graduated with a doctoral degree (RNDr.) in 1952 from Masaryk University. With a career in physics spanning more than seven decades, he began teaching lectures and seminars in the mid-1950s that produced some of Czechoslovakia's top scientific talent in fields as diverse as astronomy and astrophysics, history of science, crystallography, optics, condensed matter physics, materials science, and science administration, a small sample of whom were interviewed and included as part of this project. He helped establish and scale up the Institute of Metallurgy of the Brno Branch of the Czechoslovak Academy of Sciences, today known as the Institute of Physics of Materials, where he mentored a succession of graduate students, a small sample of whom were likewise interviewed for this project.

He developed his scientific expertise in X-ray crystallography, specifically lattice parameters, and its applications in materials science, and published in international journals of record in these fields. In the history of science, he has published and taught extensively on the history of the mistranslations and misinterpretations of Isaac Newton's First Law of Motion. Equal to his passion for science is his devotion to science teaching, pedagogy, and science administration and governance. He developed his teaching expertise in experimental physics for a broad community of practitioners, translating physics textbooks from English to Czech and organizing UNESCO-funded research into physics pedagogy. His activity in the research and reform of physics pedagogy began in earnest in the late 1960s and remained long into the transition to the Czech Republic. In late 1970s and in 1980s, he was also active within the “Underground University” and encouraged some of his students and colleagues to participate in its activities. Professor Černohorský is one of the architects of the reform of the administration of science in the Czech Republic following the Velvet Revolution. He was the main founder of the Czech Rectors Conference and was the founding Rector of Silesian University.

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Burnett: [1-00:00:16] This is Paul Burnett interviewing Martin Černohorský for the Martin Černohorský oral history. And it is July 8th, 2018 and we are here at Masaryk University rector's Office in Brno, Czech Republic. Welcome, Professor Černohorský.

Černohorský: [1-00:00:53] Thank you.

Burnett: I would like to ask you, when you were born and to tell me about your childhood.

Černohorský: [1-00:01:10] That means I should say something about the first years of my life. Yes. That means I must say that let's say the first four or five years, I only know what I heard from my sister and from my brothers. But my own experience begins let's say with age five years. Before going to school, of course, I was going to this kindergarten. And something of this I remember very well. First of all, once I was very unhappy when the teacher took from me something that I found on the ground. It was a prism, and I had never seen anything like that.

Burnett: Beautiful.

Černohorský: [1-00:03:19] The spectrum [of light], and so I was so enthusiastic. But, the teacher asked "What do you have? Do not. You will make your eyes sick!" and she took from me the prism and threw it down in the gutter. It was broken.

Burnett: Oh my goodness.

Černohorský: Perhaps my first physical observation!

Burnett: Right, right your first science.

Černohorský: I was very unhappy to be...

Burnett: And you just found this prism on the ground?

Černohorský: [1-00:04:32] Yeah. It's interesting and I have good memories. Of course, the teacher was a good woman. Yes? They had no knowledge of what a prism was and that it was not dangerous for my eyes.

Burnett: So you were born in the 1920s. Is that right? You were born in 1923, is when you were born?

Černohorský: [1-00:05:16] Yes, 1923.

Burnett: So these earliest memories, it's in the late 1920s?

Černohorský: 1928.

Burnett: And did you have brothers and sisters, any siblings?

Černohorský: [1-00:05:38] Yes, I had two brothers and two sisters. These two brothers and one of the sisters, who were from the first marriage of my mother. And from the second marriage we were two, with my 3-year older sister.

Burnett: So your mother was married a second time to her husband, and they had two children. It was you and your sister, and in 1929, there was the Great Crash of the stock market. Was there a change in circumstances around you in the 1930s? Can you talk about what happened around you in the 1930s?

Černohorský: [1-00:07:09] You are asking about 1929. Why do you choose just this year?

Burnett: Oh the crash of the stock market and the economic crisis. Of the 1930s. Was there an impact for your family?

Černohorský: [1-00:07:42] You mean the crash in New York? Yes. I understand. No. No, I must say, as for our family, this was nothing which would change anything in our life because it was not good enough, whether a crash or not. [laughter]

Burnett: Okay, so you had modest economic circumstances, not a lot of money.

Černohorský: [1-00:08:37] One could say that, because my mother was alone with five children, and we were hoping that some of my elders would be able to earn something. But frankly speaking, the hope was not justified.

Burnett: So your father was also named Martin.

Černohorský: Sure. Yes.

Burnett: And he was a tailor. Is that right? His profession. He was a tailor?

Černohorský: He was a tailor.

Burnett: [1-00:10:00] Okay And in the 1930s you started to go to school. You went to school in?

Černohorský: 1929, yes.

Burnett: Do you remember enjoying a particular subject? Did you like math? Did you like science? Did you like history?

Černohorský: [1-00:10:37] As for the first year of the elementary school, my memory is plain, nothing in it. The second year, this is another thing. I remember the name of our teacher. He was a director of the elementary school and he was a good man. Of course, it lasted just a few weeks because in November I was already outside of the home.

[1-00:11:36] And I visited another school in Předklášteří. Porta Coeli is the famous cathedral and there was a municipal, meaning from Brno, municipal convalescence home for children and there I was for some two or three months. After that I had to go to Valtice. This is a town near the frontier of Austria. And there was, not an orphanage, but

[just for education of children from social families or for other reasons.

Burnett: And so, you were moving from school to school. You went to three schools, three different schools at this time? You were moving from school to school frequently.

Černohorský: [1-00:13:33] Yes. Yes.

Burnett: Was that difficult for you to study, to concentrate?

Černohorský: [1-00:13:41] I must say, not. And also in the next years the same repeated from some reasons, and I have good reminiscences for instance for the school on Mendel's, not street, but you know, a great place in the town?

Burnett: Okay, like a plaza?

Černohorský: [1-00:14:45] At that time, there was also the Mendel Museum there and there was some school and from this school I have something I remember very well, that is the first law of motion from Newton. Naturally the teacher didn't say that something about Newton, but she explained that if you have a globe, and if you put it on the ground, after some time it will stop. If you made the ground better, then it will stop later. And if the surface of the globe you make better, it will stop —

Burnett: Even farther.

Černohorský: That means this law of conservation, this was the class, and I remember well that at that time we learned also to know the hours. Clock.

Burnett: Okay, right. You learned to tell time.

Černohorský: [1-00:17:04] Today, it's impossible to not know by the age of nine. I had no difficulties. In the fifth grade of elementary school. It was again in Předklášteří, Porta coeli and this was very interesting because there were two divisions, because some parents didn't send their children to the near town to go to the higher elementary school and eight years was duty to go in the school, and that means there was in the fifth class the first division. It was the norm as for me and then for all those, six, seven, and the teacher was a good teacher and so I could learn something from what he explained to the second division.

Burnett: So you had multiple grades in the same classroom.

Černohorský: Yes.

Burnett: In the same class. So you were paying attention to the more advanced, you were learning ahead of your level, above your level.

Černohorský: [1-00:19:05] Yes, and then I was finished with the elementary school.

Burnett: But before we continue, can you tell me about Brno the city, at that time in the 1920s and 30s? Can you describe, it was an advanced industrial city, right? Can you

describe, as a child, was it full of life? Was it full of people? Can you tell me about it?

Černohorský: [1-00:19:53] We were already living in Královo Pole, and this is a suburb, which belonged, not to Brno, but after World War I many suburbs became the so-called Greater Brno. And so we were living in this former suburb and my mother said, “today, I must go to the town.” That means to go to the central part. I don’t have any special memory or memories, no, nothing special for Brno. As for elementary school, gymnasium, it was another thing.

Burnett: Well, in elementary school you moved from school to school. So you were changing your environment and you said that it was not difficult for you to move from place to place. Is that right? You were not distracted in your school studies by moving from school to school?

Černohorský: [1-00:22:00] No, no, nothing difficult.

Burnett: So in the school system, you have six grades for elementary. Is that right?

Černohorský: Five.

Burnett: Five grades and then in 1934, is that when you finish elementary school?

Černohorský: Yes.

Burnett: Okay, so you’re 10 years old, 11 years old. And then you go to a *realgymnasium*.

Černohorský: [1-00:22:43] Yes, but it was not quite clear, because my mother consulted my teacher and she said to my mother, “I would propose to give him not to the gymnasium, but to the upper elementary school, not gymnasium for these three years, because you must think that gymnasium will cost something, and you have not money enough. I would recommend to and, please, as for me,” the teacher, “I have no gymnasium; I have a teachers’ institute, and to this teachers’ institute one could go from the middle school.” Yes? And the teacher, it was something, yes?

Burnett: So she was saying you can go to the Upper Elementary?

Černohorský: [1-00:24:42] I don’t know how, but my mother decided I would go to gymnasium and it was a good choice because, from the first year, it was not even two months and I earned very much money.

Burnett: How did you earn money?

Černohorský: Because my neighbor was not successful.

Burnett: You mean your classmates?

Černohorský: [1-00:25:41] Their fathers consulted our class teacher and she said, “Please, hire him [Martin],” and I was paid for this work 150 crowns. And, one year later, after my sister graduated from two years in commerce school, she got as a monthly salary

200 crowns. That means what I earned as a student was approximately the same. And what we were paying for our flat, 250 crowns.

Burnett: Wow.

Černohorský: [1-00:26:52] So that means you can imagine it was not simple for my mother. Yes, but she made a great effort, she was working for the Army.

Burnett: Oh, she made the clothes—

Černohorský: Yes, the coats.

Burnett: She would sew, she was sewing?

Černohorský: I was helping her but not very much because it was much better to go to schoolmates in their families and to add money [to the family budget].

Burnett: [1-00:28:00] So you were a tutor for classmates. Their parents would ask you “Help my son with math.” It was math the subject that you that you tutored other students? The subject that you tutored your classmates in was mathematics or science?

Černohorský: [1-00:28:37] I was paid for working with them, and it was institutionalized the next year in the second year of gymnasium. And new professor of mathematics came, a good professor, but severe, very strict. And it was a short time before my clients were numerous. It was a third of the class.

Burnett: You were tutoring one third of the class? Wow.

Černohorský: [1-00:29:34] And it was continued during all the gymnasium. Yes? Morning in school; p.m. with the families. Late evening coming home, and working in preparation for the next day, because it was necessary that I be prepared for what was supposed to be covered in Latin, etc.

Burnett: Right, you had your own school work your schoolwork to deal with, right? Did teaching help you with your understanding? Did it help or was it an obstacle? Did it did it get in the way of your own learning? Did you sacrifice?

Černohorský: [1-00:30:50] No, it was a good time because I was very satisfied to explain it. So I asked naturally our mathematics teacher what what’s with my schoolmates? And he said, “Oh, I see you are teaching very much!” And proudly I said “yes, of course.” The teacher said, “Yes and what is your price for an hour?” And I very proudly said “three crowns” — because I knew that at that time a worker on the street, hard work, raining, not raining, for an hour, was paid two crowns 70. And I? Three crowns. I saw it. I am just sitting and there are families where I get something to eat. But this professor of mathematics said no. The next day, our teacher, who was German, said at the beginning that I should stay after the lesson, and she said to me, “I have heard from the colleague” — this was the mathematician — “that you are teaching,” and I again proudly said, “Yes Mrs. Professor.” “And what to do you earn?” “Three crowns!” She said, “You are an idiot.”

Burnett: She wanted you to charge more because it was too low.

Černohorský: [1-00:34:01] It was too low, and so by the next acquisition I had to decide what should I say. “Five Crowns.” I opposed, I said but please, it’s so I will go with Elijah after the classes to his home and they will give me food to eat, then three crowns, around.

Burnett: Okay, but you said before you were making 150 crowns per month, right?

Černohorský: [1-00:35:00] This was different. You must imagine that is something. If you have one hour, or if you are engaged to work, for the let’s say several hours just to make all when I was in the fifth grade. It was so that my class teacher had children, and one of my school mates, his mother was a doctor for children.

Burnett: A pediatrician.

Černohorský: [1-00:36:23] And this was so that these two mothers were cooperating, and one of my schoolmates was very bad in the first quarter. At that time, the year was divided in a quarter system, and after the first quarter he was failing in several classes, and what to do? And therefore, I was hired for three hundred crowns to do every day all that was necessary. And he was clever, so we for the second [quarter] we were better, in each class, one grade better. And for the third, the same, and it was all the best. Yeah, really the best. And I remember, his father was an officer of the state.

Burnett: A civil servant, yeah.

Černohorský: [1-00:38:12] And he was not a man of many words. But this day, he came in our room where we were working, and was so full of joy, yes? And this was a rich family.

These boys, if it was their birthday or something like that, they received, not a book or something, but a saxophone as a gift. Yes? So in these months, I earned also more than this 300 and you may guess how much?

Burnett: Your bonus? You got a bonus? How much, another 300?

Černohorský: [1-00:39:32] This is efficient teaching, from failing to, in half a year, the best in the class, top of the class.

Burnett: Yes, amazing. So you got a big bonus of extra money for this success.

Černohorský: Extra money. How much?

Burnett: [1-00:40:00] 300 more? More? 600?

Černohorský: You are nearly there. Yes, 30 crowns.

Burnett: 30 crowns? A little tip, a little amount.

Černohorský: Yes, but it was good people, yes?

Burnett: I have some questions for you. First question is, how did you feel with this success, your success in teaching your schoolmates?

Černohorský: [1-00:41:00] It was very agreeable, you know, because they were interested, and I explained to them how to do it and I would say, “Please, till the next time you have here these exercises to work up,” and they did it right and were successful.

Burnett: So it was your first taste of education, your teaching as a young, you’re still a student and you are teaching these other students successfully. Your teaching career began already and you’re in gymnasium.

Černohorský: [1-00:42:16] Yes, I was very satisfied with it and not only because of the money, but the success. You know and most of my schoolmates and their parents were thankful. That’s a good feeling. And this was also why I wanted to study mathematics, not physics. Because I knew it was a touch naive, but in mathematics, all is quite clear. And this is a discipline where one can be successful by understanding anything in mathematics. But there would be another way, or future for me after that.

Burnett: The second question I had is the language of instruction. Was it Czech or German in gymnasium?

Černohorský: [1-00:43:47] Our gymnasium, the so-called reform real gymnasium was a very good arrangement because we had from the first grade, German, from the third, French, from the fifth, Latin, from the seventh, a choice, English or geometry? That’s where I learned English. That means these four languages.

Burnett: And you studied Latin. Did you like Latin in particular?

Černohorský: [1-00:44:50] Oh, yes. Latin is mathematics in words. [laughter]

Burnett: Many people say this.

Černohorský: *Consecutio temporum*. [the rules of grammar]

Burnett: Yes, and so you’re learning Latin is also a key to understanding languages, to understand German. There are Latin structures in our languages.

Černohorský: [1-00:45:27] Therefore in the war, during the bombing, it was necessary not to be in the train and I was taking my luggage and an Italian was helpful to me. And we understood each other very well. Because Italian is a better Latin. [laughter]

Burnett: So it was a good education in languages. You learned languages, I guess the reason I asked about German versus Czech, in that time, it’s Czechoslovakia, right? And it’s a nation of the Czech people but historically, the schools were in German only, sometimes, and there was a nationalist movement to have Czech schools and the Czech language [predominate]. How did that work in your life?

Černohorský: [1-00:46:27] No, you must imagine that for instance, Brno, sometimes one said Brno was a suburb of Vienna, yes? And for instance, my mother had German

schools.

Burnett: She studied in German only.

Černohorský: [1-00:47:22] No, one can't say "study," but the school she had was a German school and I don't know the reason in this case, but in many cases, it was so that the parents were aware that without German it was very difficult, yes? And in the Czechoslovakia of the First Republic, the [German] minority was not so minor.

Burnett: Well, the German speakers in Czechoslovakia, they were in the cities; they were in business. Was it the language of business, German?

Černohorský: And it was so that in our region, 20 percent was of another nationality than Czech. This other language was an official language.

Burnett: [1-00:49:00] In Czechoslovakia, German was recognized as a second language of the nation.

Černohorský: Yes, but not in all Czechoslovakia. Yes in those regions where more than 20% of inhabitants were German.

Burnett: Well, Brno would be a case. But the regions that are on the perimeter of Czechoslovakia on the western side around Bohemia and Moravia, it's German speakers, right? That was the Sudetenland, as the Germans called it.

Černohorský: [1-00:49:51] No, Brno was before World War One more German. That's a similar case as in Prague. Yes? Therefore, such a successful culture because in Prague, there were these three cultural regions: Czech, German, Jewish. The same in Brno.

Burnett: [1-00:51:00] Yes, and this was a center, this space of Czechoslovakia, was a center of industry. There were many different industrial activities in in Czechoslovakia at that time. Is that right? I read that in the former, not Hapsburg, but the Austrian Empire, 60 to 70 percent of the industry was inside the land that became Czechoslovakia. So it's a very industrialized place.

Černohorský: [1-00:51:43] As for the industry in this case the regions near the border were more industrial than the interior regions. Of course, I do not know these issues so well that it could be taken as something which is certainly so.

Burnett: But that's what you understood at the time. This is this is what you saw around you that there were these three important cultures. There were there were the Jewish communities who spoke both German and Czech. There's the Czechs and there's the German speakers and those are the three major communities in the big cities.

Černohorský: [1-00:53:00] There is a great difference between the times before World War One, Austria-Hungary, and then the times with Nazi Germany. This issue is very interesting. Let's say an example very near for me in connection with Ernst Mach. Ernst Mach, a German, could be a Czech physicist to the same extent, depending on the sources. Yes?

Burnett: Or the perspectives? Yeah.

Černohorský: [1-00:54:40] Yes, and let's say in 1938 at the centennial Mach celebration, Mach was born in 1838. Yes? And you must imagine '38, before the autumn Munich Agreement.

Burnett: The Munich agreement in October, 1938.

Černohorský: That's means already in such a very—

Burnett: —political situation.

Černohorský: [1-00:55:37] Yes, and in Brno, the Czech engineers, the electrotechnical *verbund*, that means the association of electrical and electronic engineers, and the German Institution for Science and Arts, they were jointly to prepare the unveiling of the famous plaque for Ernst Mach. This was a great celebration. And this before '38 and 1 March in *Osterrieich* [Austria in March 1938], Hitler occupied Austria. Yes? But in the cultural area, there were some people who were able to arrange something like that.

Burnett: So science was international or science transcended the political divisions?

Černohorský: [1-00:57:43] Yes. Yes. That's my experience. When I was in Darmstadt, it was something that was a great surprise for me. Because the people there were accustomed to that. At the technical universities, many foreigners were studying and I was not somebody from the *Protektorat*; I was a foreign student.

Burnett: Yes, and you were a scientist.

Černohorský: And my discussions with the professors there were very— when they asked “and why do you not study at home?” They knew it naturally, but it was a sign what is their thinking about it. And I could say “yes, you see it.”

Burnett: Hmm. Yes, so they were signaling, communicating to you.

Černohorský: [1-00:58:54] Yes, and naturally in the Rhine area, I was teaching there mathematics for families.

Burnett: When you were in Germany?

Černohorský: [1-00:59:05] Yes, a very very interesting experience. For instance, a soldier without legs who wants food, from the *Afrika Korps*. You can imagine what such a man thinks about the war, yes? Or, another man, which is very similar to our situation, if somebody could not do something because he's not in the [Nazi] Party.

[1-00:59:49] I had a friend who was a very good worker in a factory, but he could not advance because he was not in the [Nazi] Party. And in this case, he had an awful experience in the war because he lost his daughter by bombing. Darmstadt was a very successful bombing, one of the most successful during the war, something similar to Dresden.

Burnett: [1-01:01:00] I read that it was the preparation for [the bombing of] Dresden. There was no strategic purpose for Darmstadt. It was a small city and they bombed it to experiment with types of bombing, and it destroyed 80% of the city.

Černohorský: [1-01:01:23] And for instance, my experience from the seminars, I enrolled not only in mathematics and physics. When we take my study book you see much more than mathematics and physics; music, philosophy. And these people, for instance in the seminars of philosophy, they were not professional philosophers, but for the professor of philosophy, they took from the area of mechanics and so on.

And with these people the discussions were very interesting, naturally similarly as here. Some of them were very careful because first of all when they didn't know me quite well, but for instance that it is so strange that this professor must say that he has invented theory of relativity. I understand though why you wonder. I wondered too. He explains that it is not allowed to cite the Jews. I cannot cite Einstein. That means if I use the theory of relativity in my work—

Burnett: [1-01:04:04] So there is this dark sense of humor about the situation. They were aware of what was happening, and so science was a community. You're mathematicians, but more than that, it's not narrowly technical. Especially at Darmstadt. I understand that there was a reform of the education system in Darmstadt to be more than training; it was to encourage study of the arts and the humanities to make engineers and scientists more broad, more expansive in their learning. And it seems in your case that was true for you. Did they encourage you to study music or to study or was it you and your drive?

Černohorský: [1-01:05:10] Just a moment. I will show you a document. [break in recording. Černohorský shows Burnett original letter.]

Burnett: [1-01:05:33] "*Bescheinigung*." [Certificate] This is from Darmstadt, 1945. It's a letter from the Dutch and Belgian camp. The declaration is in English. "I declare having received for the Dutch and Belgian ... Mr. Černohorský, Martin has permission to leave the above camp to go to Darmstadt every day." Can you explain what this document is?

Černohorský: [1-01:06:11] This is already, as you see from the time, the war was not over, but Americans we're already there. Yes, and so at that time even that means, you see the date, this is from March, and in March, the Americans were already there.

Burnett: So this is for the undergraduate degree in mathematics, and this is your graduation certificate. And it says you are in good standing. "*Zehr Gut*."

Černohorský: [1-01:08:00] And so this town, it was always very cultural, yes? The history, the theater, and musicians, orchestra, yes? This cultural life was very rich. First of all, the atmosphere, I can compare it very well because I was so often here.

Burnett: [1-01:09:00] You're comparing Darmstadt to Brno, right.

Černohorský: We are speaking more about Darmstadt.

Burnett: [1-01:09:26] Well just to say that this is part of your education, and this is a time period during World War II we didn't really introduce that we can talk about in a

later session perhaps in more detail, about the war and your experiences. But the point is you continue your education from Brno and there was an opportunity to continue it your education in Darmstadt because of the war and it's a complicated story. So the history of your undergraduate education is complicated. And it's difficult. It's complex. So we should perhaps return to that in a later session. Do you think we should? We talked about your *real gymnasium* in Brno, and a little bit about your education in Darmstadt. Do you want to continue to explain that story now or should we leave it for later?

Černohorský: It's up to you. What do you prefer?

Burnett: Well, I think it's a big story. So maybe we should pause for now and return to that story in another session

Černohorský: Understood.

[2-00:00:00] **Burnett:** This is Paul Burnett interviewing Professor Martin Černohorský for the Černohorský oral history project. It is our second session of the day on July 8th 2018 and we are here in Masaryk University in Brno, Czech Republic. Last session we finished briefly talking about your education, the completion of your undergraduate degree in mathematics and physics. And my first question is, it's the end of World War Two. What did you think? What was the next step for you in your life? Surrounded by the confusion of the war. What were your hopes for the future? You're a just beginning your scientific research career as a graduate student. Can you talk about what you were thinking about your future?

Černohorský: [2-00:02:00] The situation in the end was so difficult to understand what could be, because I had no such deep survey about the situation, neither in my own family, nor quite generally in the society. Of course the main thing was that the war was over. I was in the time when Prague was still not free. I was still in Darmstadt because this was the time when one could go without difficulties on the train and so on. And as for me, I was not eager to make it back as soon as possible. Because I wanted to be, let's say, the last one who goes home after all Czechs from the camp are transported by American help to the border and to Czechoslovakia. In this respect the situation was quite simple. Other than that, among my few colleagues, I mean Czech students in Darmstadt, there was a few who didn't want to go to the camp. One would say it was even not useful for me.

Burnett: Can I ask you to, just to interrupt, so the Americans have occupied Darmstadt, and have created a camp for nationals other than Germans to be repatriated later.

Černohorský: Yes. Of course, people who were in the camp were of not only various nationalities but also of various social status because many of them were those who were forced to be in Germany as workers. Not only from the *Protektorat* Czechia-Moravia, but from Russia, yes? I was mainly interested for the group of prisoners who were free. In this case, unfortunately, I was not right fully because it was only in minority political prisoners. It was [mostly] prisoners for economic reasons, yes? And so I was not quite satisfied learning what the situation was. I was under the assumption that I wanted to give some courses. To teach, this was of course, very naive. There were for instance people there who were behaving not very correctly. They were in possession of some let's say coffee bags and so on.

Burnett: Smugglers?

Černohorský: [2-00:09:21] They say, "Oh, that will be fine for the beginning in Czechoslovakia." Nevertheless, at least I was there very satisfied because I served for the leadership of the camp to help with foreigners to translate languages. Yes, and I remember I was naturally able to translate Czech, German, at that time French and a little English, but I was introduced to somebody who was Spanish and the army people said "Show this man around; he knows everything!"

Burnett: Yes, you were multilingual.

Černohorský: [2-00:11:03] You understand? It was not so difficult to understand what the man or the woman would like to do and what is, even if you do not know the language. Their needs were very basic. And so I left the camp with the last transport to Czechoslovakia. Coming home, I saw that our flat was damaged by artillery. In Brno in the last days, Brno was free on April 26. I came some three four weeks later, and so it was this matter to help with the new flat in the same house. It was difficult and was not difficult, now that's a personal thing.

What I was interested in was of course the university and our faculty of natural sciences, and in this respect I had a very simple position because my teacher in physics from the gymnasium was in the position of associate professor at the Institute of Experimental Physics. He arranged matters so that I became active at the Institute and the director of The Institute said, "Oh, you could do something with our archives?" And so I learned to know what was going on at the beginning of the University. Because this was materials from the Scientific Council of the faculty. And my economic position was not bad because I was entitled to have a social scholarship, which was 1500 crowns per month and as the student scientific worker, the scholarship 1000 crowns [koruna], that means 2500, and the possibility to teach!

Burnett: Right, which is what you love.

Černohorský: [2-00:16:00] Fantastic, but I visited of course my childhood home. There was a situation that the man who was deputy director and had the boys' division, and this man left for the region from which Germans emigrated. And there were leader positions, and this was his case. Therefore the director said, "Please, you could help us." Naturally, I was interested to begin with my studies. Of course, due to the favorable result from the court concerning my studies in Darmstadt, I was entitled to pass immediately examinations without fulfilling specific requirements. I was fully free and of course I was able to do it, but I didn't want it, because I wanted to express that my time in Darmstadt was not to have some personal advantages. Therefore, I left these possibilities out. I finished my studies in 1950, so five years more than necessary. Of course, during this study I was employed teaching, and so I agreed to go there when I said to the director of The Institute, he was very surprised and not. No, he didn't want to do it, and said, "What are the details of how much money will you work for?" And I said, 800 gross, which was of course less than this 2500 I was offered. And he said no. I was at the time so naive that I said, "But professor, I will have a flat without pay," but of course that was nothing to do with it.

[2-00:21:15] For one year I was and not to lose this year for studying, I had Thursdays every week free to go to Brno and to have mandatory laboratories and a proseminar in mathematics. And so now I was still at that time not wise enough. Let me illustrate. My mother had an income, 500 crowns as social benefits, and I visited the office the municipal offices and asked these social worker women to let it be and to give my mother no more money. I said, "Please, now, I am regularly an employee of the town of Brno. I have an income and I am able to care for my mother."

Burnett: [2-00:23:22] That's very courageous of you at that time.

Černohorský: They said, “Please this is not your money; this is the money of your mother.” Nothing like that.

Burnett: Hmm. That’s interesting that they should say that.

Černohorský: [2-00:23:42] I came the next day to them and have the written agreement of my mother that they must do so.

Burnett: May I ask, why, why did you do that? Why did you ask them to—

Černohorský: [2-00:24:12] It’s my attitude of what to do with the money of the state, and what are the duties of the individual, for themselves, for their children if they have children, and for their parents. It’s given what I knew as a child, you learned so many family positions, and if you think it over... and we were living modestly. Now, after some months they renewed it, and I learned something more: that it was not my advice from me because my mother had a book where she recorded income and expenses. And this 900, there she had put “mine,” and I understood that even if it is from the children that, the man or the woman will not be so dependent. This was this first year, it was very agreeable for me that the faculty commission informed me that it was prepared to enable me to enroll [in university] without going to the court, but I insisted that it must be.

Burnett: [2-00:27:45] So what we haven’t explained and we’ll cover this in another session, but what you are talking about was an evaluation of students who had studied in Darmstadt [during World War II]. There was a question, a moral question, possibly, and so the court was established to decide if these students deserved to continue in the Czechoslovakian educational system, is that right?

Černohorský: You are asking what is going on with these students as a group.

Burnett: Yes, in general.

Černohorský: [2-00:28:10] That’s very different. Some of them were going to Slovakia. And there they could inscribe [enroll] without any difficulties. Yes, many of the few [the elite] became party members. In that case, no difficulties.

Burnett: So now can you explain that, that after World War II, Czechoslovakia “elects” a communist leadership that then becomes more dominant.

Černohorský: [2-00:29:24] Of course, then this was the time after the war you must imagine what Nazi Germans did, and the Soviet Army liberated Czechoslovakia. Therefore, there was much sympathizing for communists. Many of people who, after a shorter or longer time, were very against the communists. But, immediately after it was the situation that that’s what was the way to 1948. Yes, so and back to your question. There were the students from the German universities who were not allowed to have the advantages that the other ones that I mentioned that it was possible without fulfilling the normal terms, and were postponed one year to two years, and my case was very exceptional. It was, I must say it was not my merit. The Faculty was informed by my university teachers who knew the situation, with whom I consulted about this, so that means this for me was a very good feeling. You asked about the future. I wanted to become what I studied: mathematics and physics, to become a teacher at the secondary

schools, gymnasiums, vocational schools, and so on.

Burnett: So that's what you wanted to do.

Černohorský: [2-00:32:43] But as I said, I came to this Institute of Experimental Physics and my teaching, not only mathematics, but now laboratories, physics laboratory, demonstrations, this is a lot of experimental, physics and this institute also did serve students in biology, pharmacy, was given this task. So just when I was already assistant, and it was the year 1949, I was already four years in university and not yet graduated. And so the director of The Institute said to me — it was, let's say, April of 1949 — “You should write something during the vacation and submit it after the vacation as the dissertation. Then you will have the title.” My reaction was “Professor, I of course have the intention not only to graduate but also to submit a dissertation. But in this year, I would like to pass my final exam in mathematics, and next year the final exam in physics, that will be my graduation and then I feel that it will be necessary to work some two years on the dissertation.” The professor was similar as those going to Předklášteří [practical, of limited ambition]. But it was so. I passed, and I would say, fortunately, the Germans left in the building—during the *Protektorat*, it was a part of the Physics Institute of the German Technical University Brno—and when they went out, these archives were intact and the equipment was all gone except an apparatus: a Philips separator for X-ray diffraction. And so I began to work in X-ray diffraction.

Burnett: Wow. I was going to ask you about equipment, and so it's something that was left by the Nazis during the protectorate. It was an X-ray diffractometer for measuring the diffraction patterns when you bombard a crystal.

Černohorský: [2-00:37:55] I don't know what they did with the equipment. I could read what was there, so I became an autodidact. Nobody said to me, “You must go to somebody...” No. I am grateful because it's something I did with my students. Of course, this was another story. But so in these two years, I developed this and used this ratio method. This was a good dissertation. And so began my work with X-ray crystallography. Then, with these results, I attended national seminars and courses and that's how it began.

Burnett: Can I ask you what access to information you had from outside of Czechoslovakia, journals? Was their expertise from the Soviet Union that was available? You said you were a self-taught? What knowledge did you have access to?

Černohorský: [2-00:40:19] In Czechoslovakia, there was a laboratory with X-ray, the diffraction at The Institute of Solid State Physics of the Academy of Sciences by Professor Gohanovska. This woman was very well informed about this area and I was sending my students to her laboratory. Nevertheless, when she submitted the thesis for the highest form of doctor degrees—this is something else than doctoral dissertation—then I was invited to give the opinion because I was already in this time on the level that was right.

[2-00:41:51] For instance, this laboratory of the Academy was not among the laboratories of the world that took part in this project of the International Union of Crystallography precision measurements. It was it seemed to be too much for this, because to participate and not to be able to present adequate results is not good. Then it's better not to take part. But this Professor Gohanovska was very active because every month, she organized a

seminar, and so from the whole country came people to this seminar in Prague. And this was also of course already more than 1952. 1952 is my doctoral dissertation and '55 is the foundation of the Czechoslovak Academy of Sciences. And in Brno, where some laboratories were established, and one of them was devoted to the study of metals. A similar laboratory was established in Prague and it was decided that the Brno laboratory should have fifteen people. And it was a technical section of the Academy that was in the hands of the engineers. The academic Píšek was from the Technical University, whereas these engineers wanted to have somebody who would give service in the area of physics. Therefore, the effort to have somebody else, and as I was known in that town as an autodidact in X-ray research and from other activities, therefore the negotiation with the dean, who agreed at least under the condition that I would continue to give the basic course in physics because this was already the time, 1956, when my basic course for physics was well-known in the community of physicists.

[2-00:46:42] Yes, it was a lucky opportunity because I had a free hand to do what I wanted, and this was given partly by a very unfortunate situation because, in physics, there was this professor of experimental physics and professor of theoretical physics, Zahradníček and [Otakar] Hostinský, and professor Seifert, one of the Rectors, this was a mathematician. These three were members of the scientific council of the faculty who voted against communists, and so both professors of physics were totally unacceptable to the Communist leadership. And there was an effort to get them out of the University.

Burnett: They fired them?

Černohorský: [2-00:48:35] Yes, but this professor of theoretical physics Professor Hostinský was a colleague at Charles University with Minister Nejedlý, Minister of Education, a communist politician. And so I heard from one man from this situation who was supposed to fire Hostinský, said to me I explained to them — that means to the communist leadership — that if I do something against Hostinský, then Hostinský sits down and writes “Dear Zdeněk...,” to his colleague the minister of education, and this will be then...” That’s a story, just enough for now. For my director of the Institute, he had only one year to go before becoming emeritus. They could be better to let it go, but they visited him, these two politicians and asked him to go *sua sponte* from the University.

Burnett: As soon as possible.

Černohorský: [2-00:50:50] Yes, and I know it very well because he explained to me various things for this area because I did all the administration work with him, and concepts of letters prepared for him, and so on. They visited him in his office and asked him to leave. And he agreed in such a way as to leave without anything said. He just stood up and left the room, and left them in the room alone. These are already such details, but you have at least some [idea of] what was going on.

So I went to the academy. I continued, and so when the state committee for universities was established, and one for each for mathematics for physics for chemistry a distinguished Professor should be in the commission. Then, in physics, none of these two was acceptable, and the first session of the commission was in Brno in the middle of the state from Slovakia, from Prague, and so our faculty had to serve for the background, that is, to record everything that took place. And somebody said that for this work the best

will be to engage Černohorský because he knows steno [stenography] and so I prepared elaborations. One, steno. “What? All words?” “No, steno.” And then to elaborate [in final notes afterwards] I became, instead of these professors, as a student, the member of this State Commission for Reform, and so once I had this basic course I could do what I wanted.

Burnett: You had freedom.

Černohorský: [2-00:55:07] Freedom, and already the first group [of graduate students], they were twelve, and so successful that today they are already emeritus, but half of them became university professors, and the others were also successful, but it would be necessary to explain why it was so well known but maybe later.

Burnett: Yes. Sure. I’m wondering if you could talk about. So are these the Leipzig—? So who is Professor Holzmüller?

Černohorský: [2-00:56:15] Yes Holzmüller.

Burnett: So can you talk about that? And there’s a number of students that are part of this story. Can you explain this?

Černohorský: [2-00:56:45] For my life, he was a very important man. He was director of the Polymer Physics Institute. Among others he was in the small group of about seven students when Heisenberg was in Leipzig. Yes, but he was after the war evacuated to the Soviet Union. The Soviets took a group of physicists and he explained to me he was satisfied there because the Soviets had interest here, too.

Burnett: To allow him to pursue his science.

Černohorský: [2-00:58:00] Yes. This is what I wrote to you in the mail that it was in the 50s hardly possible to travel in the West. But it was very possible to have some connections with German Democratic Republic. Yes, and this was the case between Leipzig and Prague. From Leipzig, the scientist in charge was Holzmüller; from Prague, people from some institute, and this exchange was such that students from Leipzig were ‘56 in Czechoslovakia and in ‘57 students from Prague studying in Leipzig. And for this exchange, I was engaged. I was asked to go with. Yes, it was an act of friendship—

Burnett: International cooperation?

Černohorský: Collaboration Prague-Brno.

Burnett: Oh, I see.

Černohorský: [2-01:00:00] To be invited, it was not the usual.

Burnett: No, it was unusual.

Černohorský: [2-01:00:30] But because I did well in the German language, it was not unnatural that I was asked to be the speaker of the group, when we were invited by the Rector and these officials. And so I became acquainted with Holzmüller and now ‘58, the

hundred year from Max Planck—

Burnett: The centenary of Max Planck's birth.

Černohorský: The celebrations were in West Berlin. But the German physicists, they're very clever, and the main annual meeting of the German physicists was held in Leipzig and simultaneously a great Conference of

Burnett: Of the theoretical physicists.

Černohorský: [2-01:01:53] Yes, and from Berlin, similar timing, so that to Berlin the world physics community went. And Professor Holzmüller invited me because he knew me, and I was with Professor Vasicek. He was sent out by our Academy of Sciences and so I was in this great meeting, of course, I was very glad to have the opportunity to see, and not only to see but to hear Heisenberg, Dirac, yes?

Burnett: So you saw Heisenberg, Dirac, Max von Laue, Lise Meitner?

Černohorský: [2-01:03:00] Max Planck in Darmstadt.

Burnett: Okay. So there's all of this connection to these—

Černohorský: Yes, and as if that weren't enough, Holzmüller wrote to me to ask if I could submit a contribution. I saw to it that if somebody should have this privilege to attend something like that then one must do something [2-01:04:00] which would help Professor Holzmüller to make it possible for him to— Therefore, I wrote and I submitted "Problems of Precision Determinations—"

Burnett: "—for Lattice Parameters." That's the lattice parameters paper.

Černohorský: It was in two parts. I gave charts for cubic lattices and the ratio method.

Burnett: Which was your dissertation, right?

Černohorský: [2-01:04:51] Here in this Leipzig conference is the source of my research career because for cubic lattices, success! And the discussion it was in the largest auditorium, during the main time [of day]. In the break, I met Max von Laue. I had no experience. [laughs]

Burnett: But you were in heaven. You were in the heaven of physics.

Černohorský: [2-01:05:38] But I was well-prepared. And charts for cubic lattices, success, and discussion, they found what were the advantages, very favorable. And Hosemann, a physicist from Berlin said, yes, okay. Now, it would be good to have the same or something similar for two-parameter lattices. Yes, I heard it in this moment the laughter in the auditorium. It's because it is something similar as in mathematics: functions of one variable, the system, and now the theory of functions of two variables. This is such a great difference much more than from two to seven. Yes, and therefore this laughter, but in a good spirit, yes?

Burnett: With some sympathy for you, right?

Černohorský: [2-01:07:23] That means it was a success with cubic lattices, and after my presentation, in the break, somebody came to me, William Parrish. It is this Parrish who sent to the Moon with Apollo 12 an apparatus to do a diffraction analysis of the moon. This is William Parrish and he was then in the leading position of the commission of a pair of equipment operators of the International Union of Crystallography and he wanted me to attend the following year, 1959, the conference in Stockholm where the conclusions for the project that was ending. I said to him, yes, it's not so easy — it was a tactful expression — not so easy to go from Czechoslovakia. But the International Union of Crystallography wrote "all expenses will be paid." And so it was not easy for our political places to show is the situation right now. And I could go next year to Stockholm. And the main people from this area, yes, and I not only presented my contribution but Rovinski from the Soviet Union was not there. I don't know why, and I was asked to present also his contribution. So I came in the minds of these top people with my ratio method. Yes, so I could go the following year, 1960, to the 5th International Congress of Crystallography to Cambridge.

Burnett: Wow.

Černohorský: Yes, the world's physicists, crystallographers, and there I presented charts for cubic and two-parameter lattices.

Burnett: So you showed the audience that was laughing that it was possible two years later.

Černohorský: Yes, possible. But, of course today, it's nothing, but in those days, it was a top—

Burnett: Achievement.

Černohorský: Yes.

Burnett: So did you go to Cambridge?

Černohorský: [2-01:12:07] Yes! But, it was my last trip to the West because I was asked by the secret security office. A man, officer so-and-so, telephoned me before I went to London, and we had already with my wife the papers prepared. The man said, "I would like to have an interview with you." I said, "You can come to our Laboratory for the Study of Metals." "Oh, no, not the laboratory." I saw, no, it's no. I assumed they would wish that my chief would be with us in the interview. They responded, "No, absolutely not." I said, "what, should I go?" I didn't say it, but should I take this over to him? He said, "No, we can meet in a restaurant or..." No. Can you imagine you would like to meet with such a man in a restaurant?

Burnett: Not very comfortable.

Černohorský: [2-01:14:53] So I invited him to my home he agreed and he asked me now you are dealing with precision measurement of lattice parameters, atomic physics. "Yes now for these people." "And you will be in Great Britain? You could make person some

snapshots, photographs.”

Burnett: He asked you to spy?

Černohorský: [2-01:15:26] Yes, something like this, and I my reaction while I was quietly is it not too detailed not this is not this great. I said to him, “Please, my intentions and what I imagined how a scientist from a socialist country should behave in a foreign country is another one, and he said me, “Oh well. Be careful, be careful opposite the British security,” and I said to him, “What do you mean by that?” “Oh, you can see if you wish. I can explain to you. Do you admit I say these details?”—because the result was that—this is 1960—I could only go to the West after 30 years. Therefore these details, and he said “do you admit that you will go to a restaurant, that if you see that it is all occupied and only one place at a table where a lady is sitting. If I really eat and sit with her don’t you admit that you will speak with this lady?”

“It’s not my custom.” “No, but if she does, then you will react. So and now you have it. In that moment comes a man in the restaurant, declares himself as the husband of this lady and slanders you. And you must go to the police. Yes? Do you admit it?” I see that I said, “It’s highly improbable, but principally I must admit it that I must go.” “And at the police they say to you, ‘We will inform your wife!’”

Burnett: Blackmail.

Černohorský: [2-01:19:23] And so the result was that I was allowed to go, but my wife had to stay, give back her passport, and I was not allowed to various invitations except some special things, for instance, the founding of European Society of Physics in Florence, and to go to Moscow because there was in 1966 the Seventh Annual International Congress and General Assembly of the International Union of Crystallography. In Moscow, I used the opportunity and with the representatives of UNESCO I offered to make an international project on International interdisciplinary teaching at universities. This was 1966. The result is that I was invited in 1969 to Paris to work with a group of 18 experts from all over the world: the conference on interdisciplinary teaching, because I had two projects I made that are also interesting. As a result of this Paris/ UNESCO action, I was invited to write a trend paper on postgraduate training of physicists for the great conference on physics education in Edinburgh, 1975. Unfortunately, I was not allowed to go there but the trend paper had great success, and so the way was prepared for the next great Conference of UPAP, Institute of Pure and Applied Physics. The proceedings of the great conference on postgraduate education of physicists were in Prague, which was the first time after the Soviet occupation in 1968. Nobody was successful to organize something like UPAP in Prague until then. This was a great success. So in short, this was the change from Professor Holzmüller to the Prague conference on physics.

Burnett: And a tension. There’s a tension between your international recognition and success outside of Czechoslovakia and for the very same reason the state of Czechoslovakia does not want you to leave. You are a security risk, or you might be a security risk. And so were you able to go to Paris? Did you physically go to Paris in 1969?

Černohorský: [2-01:25:00] 1969, Paris, UNESCO, yes, this is why I said these exceptions, because in Moscow 1966 I used these people from UNESCO. I offered to

them two projects, which were done not by me, but my students. These projects were very successful because I arranged it so not only that they had they resolved something but the resolution, one was about the Mössbauer effect and the other one was about electron diffraction. And in both cases we prepared forty sets of materials and gave them to UNESCO, and UNESCO disseminated them immediately after. That means that the institute, the faculty who developed this had materials prepared and any teacher, no expert in Mössbauer, could do it. And I was very modest with money. I didn't want too much from UNESCO. They gave it to me and I was entitled to these resources which was something so unusual that the people at the Ministry [of Education] asked how it is possible that Černohorský has this, and I gave somebody who wanted to go too, and I gave him from this money for his [expenses].

Burnett: That's wonderful. So briefly, can you tell me about Paris in 1969? Describe the experience of being in Paris outside of Czechoslovakia.

Černohorský: You mean how it is?

Burnett: How did you feel? Did you feel excited?

Černohorský: To be in Paris and in UNESCO headquarters and to be with people like Holton. Yes? That's something that is so unexpected. Holton is the American from Harvard.

Burnett: Crystallographer?

Černohorský: [2-01:30:00] Famous personality and the first word when we met, "Ah, you are from Brno? What about Mach?"

Burnett: Interesting.

Černohorský: [2-01:30:31] This is another thing, my activities concerning Mach. But this I would not open.

Burnett: I think we should save that. It's about your history.

Černohorský: [2-01:30:47] But this is something very special and important because it is published in a journal of medicine. But maybe later about Mach. This is a great story.

Burnett: Let's continue tomorrow for our next session.

Burnett: [3-00:00:00] This is Paul Burnett interviewing. Dr. Martin Černohorský for the Černohorský oral history project and it is our third session, July 9 2018 and we are here in the offices of Masaryk University in Brno, Czech Republic. Welcome again Professor Černohorský.

Černohorský: Thank you.

Burnett: [3-00:01:00] In our last session, we left off in the 1960s. And in the 1960s, there were student activities around the world in the United States, in Europe. Everywhere students were protesting for reforms, for change, sometimes for revolution and there was activity in Czechoslovakia in the 1960s, movements for openness, for reform. And you were teaching at that time and you were teaching students in physics in Czechoslovakia. Can you tell me about teaching in a climate of political change and instability? How did you proceed as a teacher of students in that situation?

Černohorský: [3-00:02:51] Understood. Unfortunately, the 60s were as regards my teaching were the weakest point in my career. I have a good explanation. My teaching activities at the universities were very intensive after World War II, in the 40s, then naturally 50s. But in the middle of the 50s, I went to Czechoslovakia Academy of Sciences to the Laboratory for the Study of Metals, and our small laboratory was very successful and the outcome was that it was decided that a great institute for the technical section of the Academy with research on materials would be established not in Prague, where there was also such small laboratory, but in comparison, we were more successful [in Brno]. That means that we had to prepare the establishment of The Institute for the Study of Materials, with not only a laboratory but also an institute with the final number of employees about a hundred and fifty. And you can imagine if we are only 10, and I am the only from the natural sciences and now this starts. There was no possibility for me to have much time for teaching that means I had some lectures at the faculty, but it was not [significant]. That means the 60s as for teaching— Another thing is the 50s and then the 70s, yes, but in between... There was another reason because, with this project of the International Union of Crystallography, I had much to do with my research. That means the 60s ended with my inaugural dissertation of this thesis of precision measurements.

Černohorský: [3-00:07:21] And I was invited in 1966 by the dean of the faculty to do something so I could continue at the university as associate professor. This invitation was in 1966, and in 1969 I came from the institute back to the university, from the Institute of Metals and back to Masaryk University and of course this was already in the time of the Prague Spring. Therefore, it was in a sense easier to go to Paris for the UNESCO project. It would not have been possible five years before, but in sixty-nine, it was in connection with the 7th Congress and general assembly of the International Crystallographic Union in Moscow where I proposed to prepare for UNESCO two projects, one concerning teaching Mössbauer, and the other one to teach electron diffraction. The first one I got electron diffraction and Mössbauer. That means, coming back to your question, from this 60s, I had no direct experience with the student community.

Burnett: Okay. So at the Institute of Metals your colleagues were professional engineers. You said you were the only person in the Natural Sciences as part of the original group of

ten who were there.

Černohorský: [3-00:11:00] A short time if I say only me, because, from the 50s from the teaching I had some students, and so our to-be-established institute had resources in my students, and so this originally purely technically oriented just for applied science became an Institute for basic research. Yes, my students were engaged in our first laboratory and then the institute for diploma work and the students were very good in this. And foreign visitors when they looked at this diploma dissertation, they were surprised that it was not a doctoral dissertation.

Burnett: Very advanced research.

Černohorský: [3-00:12:56] And so this was the way we built the institute for basic research, naturally applied also.

Burnett: So this is metals research. The physics of this metals research could have applications for industry, for example. So you said it's basic research. But of course a lot of basic research in metals, for example, has applications to research for industry: making steel, making chemicals, these kinds of things. So were industry representatives interested in the research that your institute was doing?

Černohorský: [3-00:14:49] It was both, and the way how to do it was that there were some engineers who were very skillful in mathematics. And among my students there were some who were practically oriented too, and so this tandem of the mathematically educated engineers and practically skillful physicists was very successful. It would be bad if I forgot to say the 60s, this is not only Prague Spring, but also '68, the occupation by the Soviets and after that, in '69 the so-called "Normalization." Yes? Therefore also what was going on with my procedure, it began '66, and after three years, that's a long time.

Burnett: Yeah, but by your "procedure," are you referring to the inaugural dissertation or the building of the Metals Institute?

Černohorský: Procedure for becoming assistant [Associate?] Professor.

Burnett: [3-00:17:00] Okay. Now, just to add a question to that, your doctoral dissertation was on the ratio method and that was published in 1952; right now "inaugural dissertation" is another. Can you explain the difference between your doctoral dissertation, which is your PhD in 1952. This other dissertation, what is this inaugural dissertation? Can you tell me what this represents? It's a qualifying dissertation to become associate professor. Is that right?

Černohorský: Yes. And this was the reaction to the project of ICRC. [3-00:18:00] Now, that's more personal, but coming back to your questions. In the Normalization it was already a different situation with the students in comparison with the Prague Spring. And I have also from the 50s, many of my students became university professors. But from the 70s, I have many successful students, but, for example Marie Fojtíková, who was not admitted to become to PhD.

Burnett: She was not permitted to graduate with her PhD. Why?

Černohorský: Why? It was the pressure to have people who are very communicative with the communists, and if somebody was not... That's also my case, why I became Professor [only] after the Velvet Revolution.

Burnett: So if you were not a member of the Communist Party, could you become a professor? Were there professors who were not members of the Communist Party? If anyone were not a member of the Communist party, was it possible to advance and become a professor?

Černohorský: [3-00:21:16] Well, it was not so strictly to be a member. Membership was naturally a great advantage.

Burnett: It was not strictly a great advantage. Is that what you said?

Černohorský: I said it was not *conditio sine qua non*.

Burnett: It was not essential to be.

Černohorský: [3-00:21:51] Anyway, you had to have been in agreement with Communist policy.

Burnett: Yes, and it had to be evident or clear that you were not against the Communist Party.

Černohorský: [3-00:22:23] Maybe I will try explain it with this example. The minister of education who was appointed during the Normalization in 1969, he declared what was the aim of all of the university communities, and all University teachers were told they should sign this declaration of agreement with these principles. I didn't sign. Yes?

Burnett: Can you tell me why you didn't sign?

Černohorský: [3-00:24:00] Because there was a sentence that declared that everything is in the hands of the Communist Party. This is nothing to do with science as objective disciplines.

Burnett: So you objected to the insertion of politics into the administration of scientific educational research.

Černohorský: [3-00:24:37] What happened? At that time, the director of our Institute at the faculty of the general faculty was Professor Armin Delong electron microscopy, world-renowned scientist who passed away not long ago. When Professor Vasicek, who was the director [of our institute] died, then it was necessary to have someone. And the best candidate would be a professor and member of the party. Delong was a member, but a very good man. His institute was one of two Institutes in the whole Academy where during the Normalization nobody was fired.

Burnett: He protected people.

Černohorský: Protected, yes. And so he should become our director and it was not easy. I argued with him a long time because he said not necessary that he take the position. But

I explained to him that I have no chance. Yes?

Burnett: Yes that *you* have no chance to be that director.

Černohorský: [3-00:26:51] And then he agreed so and with this signature, I said I would not sign and all people in our Institute refused to sign. Yes?

Burnett: What happened? What were the consequences?

Černohorský: Consequences? Something awful.

Burnett: They reacted. “This is terrible. This is terrible?”

Černohorský: I explained to them [members of the Institute], “Please, do not [follow] after me, because your situations were variable.” Some had children to go to the school, to the gymnasium or not to go, to the university or not. When they refused to sign, then, no hope for their children, yes?

Burnett: So there were consequences for children. If your parents were not members of the party or were in bad standing with respect to the Communist Party.

Černohorský: [3-00:28:29] But they [would have] said no if I do not say so, but at least they signed. But in the Declaration, above the signatures, they wrote “we have read.” You understand?

Burnett: No. Can you explain that?

Černohorský: That is they signed only that they read, not that they agreed.

Burnett: Okay. “We have read this.”

Černohorský: There were five in the whole faculty who didn’t sign from various institutes. And only I remained at the university. All the others were fired.

Burnett: Oh my goodness.

Černohorský: Yes, and all people signed without these, “We have read, etc.” So just to explain what the situation was like and that I owe the fact that I remained to the students.

Burnett: Why?

Černohorský: [3-00:30:42] Because it was known that my influence on the students is not negligible. Yes? One example. I am not sure whether it is not too detailed. But even if it is a personal experience for the situation, it is symptomatic. I had a student who was in the first year, good, not the highest level, average, and his father was well inscribed member of party, and this student, his father arranged for him that five years after graduation, he would become the director of a gymnasium.

Burnett: Oh my goodness. Yeah, just, corruption.

Černohorský: Yes, and so was but the condition was the student must be in the Party. A woman from the office of the dean telephoned me. She would like to come to me to visit me. It was unusual, because we came to the office. And she came and said I have a special [3-00:33:00] request for you. The parents of these students said I should go to you and asked me that I persuade the student to go in the Party. I said, what's, why? Why? No, no, no. It was a long discussion, but the main thing is that it's not so that you have nothing to say. He said to his parents, "I will never go in the Party because the Party is unfriendly to Černohorský." And it's true that I had great influence. And if I had been fired maybe that this fear that the atmosphere, they would [3-00:35:00] say "see, a good teacher, and he's fired because—"

Burnett: It would be obviously unjust if it happened and the students would see that and the students knew your reputation.

Černohorský: [3-00:35:23] Dr. Fojtíková could say the same thing. So these are my experiences with the state, but in general in the 50s, this was a time of my intensive work for building up the people. We were 10 and to grow up to 150 in other divisions they were more. I was very aggressive in recruiting people for the Institute.

Burnett: Now, you said the 50s. It's the 60s that this is happening, right? The Institute the building of the Institute is during the 1960s during this time of the Prague Spring and all of that. So you're building an institute and you're drawing people. They were former students you the people you brought in, when [3-00:37:00] you said you grew the institution from 10 to 150?

Černohorský: No, not in these years. This was the final number. But it was going up.

Burnett: Right, by the 1970s, it was big.

Černohorský: [3-00:37:18] I had the administration of the institute in my hands. That means the negotiation in Prague, with banks, money, and the academy, and the architects for instance, the building, the division of physics was on the third floor, and I wanted for the [3-00:38:00] architect to give them smaller rooms that people have quiet for work and good acoustic insulation.

Burnett: Yes, that's important.

Černohorský: Only in the first and third floors, such things. This was nothing with do this science, but what is needed was building up a good institute.

Burnett: So there's physical, so you were thinking about the work. How do you get a good working environment?

Černohorský: [3-00:39:00] Yes, and not only in our Institute. For instance, the Institute of Scientific Instruments where Delong was the director, there was only engineers and me. I offered to them my students and also in this Institute of Scientific Instruments, the basic research was at home.

Burnett: We're so let me say at this time around the world in leading institutions, natural scientists and engineers were coming together. How did you know that that was the future? Because your plan, your idea to bring natural scientists, who think about applications, to engineers who think about theory, together, that frontier between applied and basic, and the best institutions were doing that maybe even later. You thought of this or you were doing this? What was your influence? Why did you think of this idea to bring these people together?

Černohorský: Well, first of all, it's quite natural.

Burnett: Is it obvious? Is it clear?

Černohorský: [3-00:41:00] And then I was several times in the German Democratic Republic. There were institutes and I consulted with people.

Burnett: In the DDR. And so you learned by observing other institutions? You talk to people. What should we do? And you took ideas and you brought them to the Czech Republic and made an institute.

Černohorský: And to have people from the University and from the Technical University. It's quite natural that the orientation is [3-00:42:00] different. But if they are interested in and then they see what it means for the success, they do it.

Burnett: Can you talk to me about an example of success? Tell me a story about a successful project.

Černohorský: [3-00:42:28] Yes, the work on the fatigue of materials. For instance, this team Karmazín-Lukáš, their work. They in collaboration with Stuttgart, Heidelberg, with these great institutions in the world.

Burnett: Yeah, and Lukáš?

Černohorský: [3-00:43:07] Lukáš is one of my students. He was in the first year of university studies in 1955. I began with this basic course in 1954. This state commission for reform of the [higher education], this was a great reform because before graduated from the philosophical faculties and from the faculties of Natural Sciences were destined for work as secondary-schoolteachers' organization and not for research. And so this reform [created] two possibilities: education for teacher education, or, and now mostly, the better students for research. Of course, we need good teachers, yes, and therefore what I was doing, I had no separate courses for teachers. I had together basic, to say "Please, you both are important and you must have a good background for both. No difference as for basic education in physics." After that, yes, specialization in research. But this is for the higher things.

Burnett: So what you did was there was a system of two tracks: one academic, for research, and the other is just enough physics to be able to teach and that's it. And what you did was say, "No, everybody needs a good solid foundation of education." and that's valuable for the future.

Černohorský: And also, there is some psychological side in between because this is

expression that it's not so that you are not so important as we are, but that we are both important.

Burnett: [3-00:47:00] Right, so you were almost, I must be careful how I say this, you placed equal valuation on education as a calling as a profession and research as a calling and a profession.

Černohorský: [3-00:47:23] Therefore, and it was then on already in the 1970s. I arranged things so that people who are working in research in the academy and in research institutes, that they should be interested what's going out in education, and therefore, in my seminars, both tracks were invited. And I asked people from the research to inform their colleagues from education what's new and what's important and what they could do with their students possibly to be well informed. And in the other way, teachers may ask how would you do this? And this was the seminars that's already 70s and 80s, but we are still in the sixties.

Burnett: [3-00:49:15] Yes. Can I ask, this is probably too much of a connection, but your early teaching, you were teaching, even in the 40s, physics for professions, physics for pharmacy, physics for industry. So you were teaching applied physics? Was that experience helpful? Did that help you to think about education reform? Did it help you to build the Institute of Metals into this larger organization with applied and research scientists working together, engineers and scientists together? Was there any inspiration from your earlier career in teaching applied physics?

Černohorský: I was very attentive, but I was not successful to understand the main thing you intend. Sorry.

Burnett: [3-00:50:45] Yes. The question is inspiration or learning? Did you learn from teaching in the 40s, teaching applied physics? Did you apply your later challenges in the 60s, to build the institute for example?

Černohorský: Certainty, but it's a natural process. There is no difference, I would say, between my activity in my eleven years at the beginning of the gymnasium and the activity [3-00:52:00] with teaching special topics for experienced researchers. I explained this already at the beginning. If I speak for the first time to my students, I explain to them the three worlds of Karl Raimund Popper.

Burnett: The three worlds of Karl Popper. What are those? What are the three worlds?

Černohorský: [3-00:53:00] I ask have you heard the name Popper, Karl Raimund Popper, the most influential philosopher of the last century. Yes, and I explain what does it mean these three. Naturally Popper writes books about this. I say it in a few phrases. I say the first world is what we see around us, what we explore in the natural sciences. That's our job. The second, this is the world of our mind. And I was not correct. It's not singular, of our *minds*. There are as many worlds as there are *minds*. And the third world, the theory of algebra, a product of the interaction of the second world with the first. Yes, and when the theory is worked out, it has its own life independent—

Burnett: Of the first two worlds?

Černohorský: [3-00:55:52] What we're doing in our lectures, in our seminars, we will understand this third world. What's the product of the minds? And to be successful, we must understand each other and now it depends how I will be successful in understanding what's going on in your mind and how you will be successful in understanding what's going on in my mind. Yes? And so we must be eager to understand each other. Without this, nothing is to be expected. And, this coming back, at 11 years old, I didn't know three worlds, but the idea — to understand my schoolmates and that my schoolmates understand me — is the same as in my ripe years teaching as a professor.

Burnett: [3-00:57:00] So the three worlds: the world that we sense around us. The physical world is that first world. The second world is the intellect, your mind, and there are as many second worlds as there are people. Each person has a different mind. The third world is the abstract theorization of the first two worlds the physical world around us. The third world is a product of the second world of the minds that produce the abstract algebra that shows the representation of the world around us. Are those the three worlds? Is that accurate?

Černohorský: [3-00:58:00] Product of the second. And then, I don't know who was this man who elaborated the theory of relativity, Einstein. Yes? But there are other theories: Leibnitz, Newton, and so on. But it is not necessary to know that it was from Newton. It has its own life independent.

Burnett: [3-00:59:00] And that's why it's a separate world. It's independent of the person who thought of the theory. The theory is separate, independent of the mind. It stands outside of it. It's a product of the mind but it is separate from the knower, is what you're saying. Well, we're talking about teaching. You're talking about inspiration. It's something you say at the beginning of your classes to your students. Can you talk about inspiration? Can you talk about what is beautiful, interesting? What makes you passionate about physics?

Černohorský: [3-01:00:00] Yes, this is a very very important thing, inspiration. It's sometimes difficult to find the proper way. I would like to give an example. When I began my, let's say, famous course of basic physics from 1954, I saw that these 12 people had [3-01:01:00] very good disposition for creative work. Yes, but this is not sufficient to know this? It's not. It's necessary to evoke it.

Burnett: To evoke creativity.

Černohorský: [3-01:01:32] So I say to them please we have a duty to have four hours classes a week and for two hours exercises every week. It's our duty, but you will have the possibility to be with me another two hours in a circle. And the rules are like this: it's no duty, and you can go in at any time.

Burnett: These are your office hours. They can meet with you they can talk with you. Is that what this extra two hours is?

Černohorský: It's not consultation. Okay. No, no, no, regularly. Let's say Wednesday, 4 to 6 pm is this circle.

Burnett: [3-01:03:00] A circle, it's a circle?

Černohorský: Group, a group, and you can join at any time, from the first or in between the semester yes, fully free. Yes, and, it's not a duty.

Burnett: You're not required. It's not an obligation.

Černohorský: You will see you can see what we'll do and I took a book about physical measurements the basics, systematically not that I explained, but they explained.

Burnett: [3-01:04:00] They would teach you?

Černohorský: Yes, me and their colleagues. Yes, we see, next time this and this chapter. And this is one point of the program, and then the long-term program, you have here 20 topics. They were 12. But I offered 20 topics. And now various experimental, theoretical, and you can have choice, and to work on it and to refer to [3-01:05:00] it. And one of the topics was Newton's law of gravitation, but please, not to take a Czech book or an English book and to see how it is described. To take Newton? Latin.

Burnett: The original.

Černohorský: Yes, and I was sure that it's impossible that somebody could make have this choice because how to know so much Latin?

Burnett: [3-01:06:00] *You* did. You knew Latin.

Černohorský: But they knew [or learned] more. Yes, and you may ask why this nonsense? And I reply, "It's not nonsense, even if nobody makes this choice." Why nobody takes? Let them learn, not well, but English, French, languages that are important. Do something for your languages, as inspiration. And the other thing, be accustomed to go to the primary source, how Newton *is*, not how the interpreter of Newton *feels*. And a surprise, someone chose to do that project, a team of two of my students chose it, and one of them knew already in his ninth [3-01:08:00] year he would become an astronomer and a world astronomer. He's Grygar, Jiří Grygar, a well-known astronomer, well-known in astronomy. And the other was a student of theology, and at that time the faculty of theology was abolished by the communists. That means he could not continue and he studied physics. But he knew Latin and we had three wonderful sessions in this [3-01:09:00] circle when they informed us how Newton, now the other students saw that it is possible to do something like that inspiration. That was why I remember this when you say "inspiration."

Burnett: And the conclusion was surprising because they learned something about the original interpretation of Newton, didn't they?

Černohorský: [3-01:10:00] With this well-known astronomer, a valuable remark. He is a popularizer of science, well-known from UNESCO, and our government established a prize for science popularization, and he was the first winner, half a million crowns. He refused it. He refused it, but in that year, the money for the Academy was cut. And he said that a government [3-01:11:00] that is so unfavorable to my Institute — he is working at the academy — doesn't deserve that I accept this distinction.

Burnett: So it was a protest he refused the money because of cuts to physics.

Černohorský: [3-01:11:32] Some weeks ago, he was invited, and he is now 82. We were invited to a great session in the Library of Moravia. About 200 people were attending, and the title was “The Teacher and the Student after 60 years.” He said afterwards that he was surprised that he thought that he knows me very well what I’m doing, but that he knows not all because they were not 12, but they were 13 at first, but I saw that one of them—I am speaking now about the teaching out from this side—I saw [3-01:13:00] that his effort was good. But the disposition for physics was not so good, and even if he would graduate he would be hardly satisfied with his life career. What I was doing, after a few weeks something like examination to prepare them. And it was clear it was not good for him, and therefore I just spoke to him. He should have another choice then, [3-01:14:00] and I helped him go to the Technical University to the faculty of buildings [architecture or design]. And that’s all, after I knew nothing about him.

Burnett: So that’s all you knew.

Černohorský: Yes. But, the World Exhibition in Japan in Osaka, the pavilion of Czechoslovakia, the most successful pavilion. Architect: Aleš Jenček. This was my student. That’s why I say our system is very bad [3-01:15:00] insofar that we do not give time and energy enough to people who decide what to do after secondary school when going to which subjects, which program. It’s necessary to speak and not only a few minutes for the admitting examination. Yes?

[3-01:16:00] Another positive example. One girl wanted to study biology at Charles University, but was not admitted, Therefore, she took biology in Brno Masaryk University. The people around her knew that I was at the University, and told her that she should go to me to consult about this. I consulted with her and I asked what do you think of biology? Is it the “factography,” linear systems, and so on? First of all [3-01:17:00] girls in biology, they are lucky to work with animals or with plants but nothing or science or biology, and I asked, what will you do, this “factography” or maybe molecular biology? And I was sure she would say the first. I was wrong. She said the second, molecular. But in that case, you would need mathematics and physics.

Burnett: So she said “okay?”

Černohorský: [3-01:18:00] Two hours with her, and I said so in that case you can enroll not in biology but biophysics to study this with me.

Burnett: Because you had biophysics in your background.

Černohorský: Teachers, physicists, biophysicists, the same basic course of physics and after two years, she was theoretically oriented and interested no more in biology but in theoretical physics. In Brno it was not possible to graduate in this. Therefore, she went to Charles University then from theoretical physics to mathematics, and now she [3-01:19:00] has been for many years the Director of the Institute of Mathematics at the University in Austria. And this is the result of this two-hour consultation.

Burnett: Yes, but you're saying universities, educational institutions in general, do a poor job of mentoring. Do you know that word "mentor," "to be a mentor?" The mentor provides leadership and guidance about your life career.

Černohorský: [3-01:19:45] You must work with the students, and not only work, but let's say in some sense to live with them, to know also in some cases their private—I was visited by the father of one of my students and he was the leading physician in psychiatry, and his wife also. And he came to me to consult and to beg me to speak with his daughter. I said, "please, but you are a professional, a psychiatrist. That's your job. I am hardly comparable and entitled to..." And he said, "This competence doesn't work in family-related affairs."

Burnett: That's correct. Yeah, that's true.

Černohorský: And, "Please, do it for her, do it for us, for my wife and for me because I know she will respect only you." Yes. He was right.

Burnett: [3-01:22:00] So treating the whole student, you know, they say this in medicine about treating the whole patient, which means, not just the disease, but the whole life. What are your habits? What are your passions? What is your history, in order to say, what is your future? So you have to know about the student's life in order to be effective?

Černohorský: To do be interested in his future, in his present, in his future, and his problems.

Burnett: And so that is part of pedagogy, which I guess is from "walking." The root of the word is "to walk with" the student or [3-01:23:00] the student walks with the teacher. And for that time, you have the same path and that's part of teaching, isn't it? You have to have a similar path so you can understand where they want to go. And you understood that it's complicated. A student you said wanted to do biology and you helped them discover that what they wanted was not biology; it was something theoretical and physics, and you put them on the path that they themselves did not know they wanted. You showed them what was possible.

Černohorský: Yes, quite right. Popper's second world.

Burnett: [3-01:24:00] Right, to enter the mind of another person, to understand where they are. Is there inspiration for you from the local genius of science in Brno, in Vienna, because Karl Popper is Vienna and Ernst Mach is Brno, and George Placzek is Brno. Are you inspired by the genius and talent from your area, from the Czech Republic, from Austria? Is it inspiration for you that so many scientists have come from this area?

Černohorský: [3-01:25:00] Yes. Brno. Ernst Mach? Only a few people maybe knew that he was in Brno just a few weeks. Placzek that's another thing. Yes. He studied in Brno secondary schools, and this factory in Alexovice and so on, and Mendel.

Burnett: Gregor Mendel, absolutely.

Černohorský: Not born in.

Burnett: No, but his scientific research was here. Yes. So there's a [3-01:26:00] pride in the achievements in this place.

Černohorský: I have got the facsimile of Mendel's historic lecture and his work from 1865. Do you know what where the question after his historic lecture and what was the discussion?

Burnett: No, in the audience? What were the questions? No.

Černohorský: [3-01:27:00] It's very simple. There were no questions and there was no discussion. He just presented a lecture and it's maybe a very special thing. It had something to do with Darwin because, before Mendel, the previous lecture was given by an eminent member of this community of researchers in Brno. The topic was Darwin's work, and Darwin's work, what was new was development and changes. But now Mendel says genetics is something which is stable. And the first was much more interesting, therefore Mendel's work nothing, and when he passed away nobody knew what was in his written work. Fortunately, it was not destroyed, not burned, but it was—

Burnett: It was ignored.

Černohorský: [3-01:29:22] Thrown away. And in the twenties, Hugo Iltes found it and also the original lecture. But it is outside of our topic, even if interesting.

Burnett: Well, it is interesting, but there is a lesson from it, in that we don't always recognize the importance of a discovery. The people at the time, they were thinking in a fixed way about something. They're interested in another track, another way and they could not see it, even though it was presented to them. They could not see this is very common. It's a very common problem in science, how to keep your eyes open to new possibilities. As a teacher, how do you do that? How do you address this?

Černohorský: [3-01:31:00] Understood, just a remark coming back to Darwin? It was so that Darwin could have had Mendel's results as support from his discussions with his opponents. But Darwin had in his library Mendel's work. But he didn't study.

Burnett: It's true.

Černohorský: Because mathematics had nothing to do with biology and Mendel's work has some mathematics, even if very simple in his work. [3-01:32:00] Darwin was aware that it would not be bad to know mathematics, and he decided with his colleagues to do something about it and they began studying mathematics. They began during vacation, but by autumn, they stopped.

Burnett: Unfortunately. Can you tell me, speaking of inspiration, when you inspire your students and when you are inspired by mathematics when you were inspired by the physical world. [3-01:33:00] Can you talk about the beauty of physics and example of there's something beautiful? I was looking at your article in *Acta crystallographica*, the patterns of the curves in your diagrams. They're very beautiful. They're very organic and symmetrical. Can you talk about moments when you appreciated the beauty of science, the beauty of the physical world. Are there moments when you remember it struck you that this formula is beautiful; this pattern is beautiful?

Černohorský: [3-01:34:00] Understood. I liked mathematics because I understood very well what our teachers explain to us, and I naively thought that this is the right mathematics. Therefore I was interested in mathematics as a discipline where one can perfectly understand, all is clear. Now, it's naturally not so, and as for your question, the beauty of mathematics and the beauty of physics, certainly all organisms when you see that there is a very good order, something which is sometimes surprising that such an order [3-01:36:00] can be where it could be perhaps not to be expected, then it's inspiring and satisfying. It's similar if you hear Beethoven symphony, you understand how it sounds, yes?

Burnett: Yes. It sounds beautiful, but there are harmonies and relationships between melody and counterpoint and you see the interactions that work together in harmony, and that's beautiful.

Černohorský: [3-01:37:00] Then if theory is found out, yes, that's it. Any creative activity brings satisfaction. Not to just read something [3-01:38:00] and know it, but to think and to find something new. I am impressed by the fact that the first law of Newton for three centuries was interpreted wrong. Yes, that's a fact. I must say I cannot understand if there is something that is important and well-known, how is it possible that for a long time it is interpreted in a way that is not correct?

Burnett: Why do you think that's true? Is it because we tend to accept greatness? We say Newton was right, or the interpretation of Newton, the translation of Newton was correct, and we assume?

Černohorský: [3-01:40:00] There is a very strange case with Ernst Mach who wrote about Newton's first law. He said, "Oh, this law, Galileo Galilei knew this law and he has it just as a remark." But from the times of Newton, this law has the position of papal dogma whereby neither Mach recognized that Newton was not interpreted in the right way.

Burnett: So this was across languages, so that it Mach was reading it in German, other people were reading Newton in English, and the translation from Latin into other languages became dogma in those languages, and it was wrong?

Černohorský: [3-01:42:07] This is only one side of the problem, linguistic. This is the external description. But what is substantial? Does not linguistics [relate to] logic and physics? But this is off the topic of teaching.

Burnett: Just one more question. Did you learn about this from the research of your students in that circle, in that group? They did the research on Newton. Is that how you learned about the mistranslation?

Černohorský: [3-01:43:00] You are asking whether the students—

Burnett: The discovery of the mistranslation it came from that—

Černohorský: [3-01:43:11] Of course, of course, that's my way, because when this remembered course of basic physics, I gave a lecture about Newton's laws and I give

them in Latin and translated it. And so I became aware, when I thought it over that something is not right. Therefore I explain it in a way how it was at the time possible and naturally what I am thinking about I say to my students even if I have not solved it.

Burnett: Yeah, it's a question. It was a question before there was an answer. But then you learned—we can talk about this in another session—you learned the truth about the mistranslation. And there was a compensation. People added an addendum to the law, didn't they?

Černohorský: [3-01:45:00] I'm very thankful to learn about such subjects about such topics because the students learn to be constructively critical. In physics textbooks, in all languages, you have the third Newton's law, the law of action and reaction. Yes? [3-01:46:00] Physically, nonsense.

Burnett: Why is it physically nonsense?

Černohorský: [3-01:46:10] Because if you explain it like this, and so it's in the textbooks that every action evokes reaction, but this is not the third law. The main concept is not force but interaction. And if two objects attract each other, then it's not so that one of the objects would say to himself "now, I will attract this." If I take your hands, and I and you [push and pull], this is action and reaction. But in this gravitation law, the interaction simply exists. And it is not so that first is action and as a [3-01:48:00] result—no. This is simultaneous action, which means here is not the law of causality, as in reaction, and if you explained this to the students, it can be well understood even if the students are not very clever, and so they can be happy they knew something, which is that what is there in the textbooks in all languages is not correctly explained, and they know it.

Burnett: So it has a dual function. [3-01:49:00] You were teaching them two things: one is a correct understanding, or an improved understanding, but you're also teaching them that it is possible to think differently than the conventional accepted way of thinking, that you can carefully think and challenge established scientific authority.

Let's continue next session.

Burnett: [4-00:00:00] This is Paul Burnett interviewing Dr. Martin Černohorský for the Černohorský oral history project, and it is our fourth session on July 9th 2018, and we're here in the offices of Masaryk University in Brno, Czech Republic. So in our last session we were talking about [4-00:01:00] inspiration in teaching in scientific research. But you also have a career in education reform. And we talked about some of your work with UNESCO and international conferences on physics pedagogy. Can you talk about physics or education reform in the Czech Republic? In the 1970s and 80s, were you involved in the [4-00:02:00] reform of the education system of the structures of educational institutions?

Černohorský: The main feature in this area was the establishment of new universities. Some time ago in Czechoslovakia, there were just two or three universities and some technical universities. [4-00:03:00] After the Velvet Revolution, five new universities were established and a sector of private universities arose, and this was a rather dramatic change.

Not only as for the quantity, but also what was going on, because it was [4-00:04:00] necessary to change the style from the times of totalitarianism to democracy. The beginning was establishing the Club of Rectors of Czech and Slovak Higher Education Institutions, which means not only classical universities but also technical universities. Something which was prepared before the Velvet Revolution — I don't know exactly the situation in Prague — but I am rather well informed about what was going on in Brno. In Brno, there was a group of people who were interested in doing something, most of all, for the young generation. So for instance, in 1985, the editorial boards for publishing works of the world philosophical literature not published in Czechoslovakia.

[4-00:07:15] We were interested in publishing translations of the leading works. The first item was [Erwin] Schrödinger's *What is Life ?* and *Mind and Matter*. Many people were involved. For instance this *Mind and Matter* translation was done by Dr. [Marie] Fojtíková. I myself translated *What is Life?* and also biographical sketches. This was favorable as we were able to get the manuscript of these autobiographical sketches of Schrödinger's from his daughter. The group organized so that we had meetings, mostly in the flat of Professor [Milan] Jelínek, a Bohemian and academic officer of Masaryk University who had connections to Paris because, some years ago, he had the opportunity to be active at the Sorbonne University as a lecturer of Czech, and so he invited French philosophers and we had not only French but also Dutch visitors, and these people brought with them literature as bases for translations. And naturally in these sessions, we were thinking of the desirable changes [in society], when the old regime would be over.

Burnett: In 1985, you were already thinking about—

Černohorský: In the 80s.

Burnett: In the 80s, so it was *Glasnost* and there is openness in the Soviet Union.

Černohorský: [4-00:12:00] So that in 1989 at the Velvet Revolution we were prepared. For instance, we were very informed about the efforts to found a university in Opava, the

Silesian University, and not only that. I was engaged later after the Velvet Revolution to give opinion about founding a university in northern Moravia. These were the two most neglected, at least for education, regions of the Republic.

Burnett: Northern Bohemia and Silesia.

Černohorský: Northern Moravia and Silesia. And, first of all, Opava is nearer to Brno; Opava, northern Moravia, and the discussions were sometimes very hard. There were objections because, and it was justifiable, we have not people enough who would be qualified to build a new university.

Burnett: Do you mean qualified to build the university or qualified to attend the university as teacher?

Černohorský: [4-00:15:00] As teachers. But, I remember that at the end of such a hard discussion, Milan Jelínek said, “Well, then it will be a better gymnasium,” as expression of the necessity to do something for education in this region, and it was not so simple as it may seem today. I remember, I was already Rector of this Silesian University and we had the visit of the Premier [Václav] Klaus, and I was eager that he would stimulate our pedagogical community with some optimism and constructive remarks. And in this sense, I began the meeting with him and I was very surprised when the reply of Klaus was “Universities should be founded in those places where there are conditions for it.” That means, here, the conditions are not. My reaction was well, then we can be here after further 40 years and to still have true statement: “there are no conditions.”

[4-00:17:00] Yes? One must begin. Just to remark how difficult the situation was. Therefore, I recommended to found the university in the northern area. In Liberec—this is a town in northeast Bohemia—[there was] a technical university and they wanted to found an education faculty for teachers, which I found useful. Similarly as in the case of Northern Bohemia, I was invited to give opinion about this, I visited. I was for the first time in that time, and when I consulted with the rector and president of academic Senate, then I wanted not to do my job just at the table and I asked to have the possibility to see the dormitories, to see the cuisine. What is necessary for the life? Oh, so I saw that. Some people on those places were surprised because it was unusual that somebody is interested in such details.

Burnett: Were there surprises for you, when you did that extra visiting, when you looked at the kitchen?

Černohorský: It was a surprise for the people in the kitchen. [4-00:20:00] [laughter] No, I would like to say even if it is rather personal my way, let’s say, in the Silesian University. Please should you find it not so important and should you have a proposal to speak on other subjects—

Burnett: No, I don’t mind, but help me understand when these things are happening so far. We have the end of The Velvet Revolution in 1989. There is a proposal to build new universities for Czechoslovakia and five universities are proposed. Plus, there’s a new private market for private universities, which emerge in this context. When is there a proposal for the University of Silesia and for the University of Northern Bohemia? When

does that happen? What year? What year is the discussion about these new universities?

Černohorský: The preparation discussions were in the late 80s.

Burnett: Oh, okay. This is before—

Černohorský: [4-00:21:53] Before the Velvet Revolution. Therefore, I said we were prepared by then. Nevertheless, if I realize that the ministry is prepared to establish the Silesian University, I talked to my colleague which who was the deputy minister of education and we knew each other from ten years in the union of Czechoslovak mathematicians and physicists, I said to him, “Please, what do you think about a new university in Opava? We have in Moravia already Masaryk University and Palacký University in Olomouc, and now we would have three universities in Moravia. Bohemia is twice greater in comparison to Moravia. There is only one university: Charles University.” He replied [4-00:24:00] “All right, put the university in Opava. We are not the only one. In Bohemia, there will be universities in the North, West and South. That means that four should be established. Well then, it was, let’s say, a battle between Opava and Ostrava. These are towns in the North and the [4-00:25:00] relation is something similar like between Moscow and Leningrad. Moscow is the seat of power; Leningrad is more culture. Ostrava is the site of steel factories. One said of Ostrava, it is the Iron Heart of the Republic.

Burnett: Wow.

Černohorský: [4-00:25:45] Okay and fine. And of course, there was no institution of higher education for humanities know that means pedigree faculty since is for teachers but nothing—

Burnett: For history and literature, languages.

Černohorský: [4-00:26:17] And Ostrava is a town which is greater [in population] than Opava. And so, where should be the Rectors’ office be, because, yes, here is the university’s official seat in Opava, but Ostrava said, “We already have a pedagogical faculty. You have nothing. Therefore it will be better to have rector’s office of the Silesian University in Opava for the first two years in Ostrava.” People from Opava disagreed with 2 years, and after that...

Burnett: Oh, so they were worried if they established it in Ostrava it would stay there?

Černohorský: And so the Minister of Education said in Opava, please prepare [4-00:28:00] already in January 1990, you should begin in autumn.

Burnett: What year?

Černohorský: [4-00:28:15] Autumn 1990, but the parliament was not the ready with the laws and therefore one begin in autumn, but for the faculties of Masaryk University, there was a special law in those times that the university was entitled to rule just on the decision, not of rectors, but of the academic senate, half of which were students. And to establish a branch, for instance, a faculty in any place in the Republic. So it was a special situation that these two faculties of the future Silesian University were in Opava and in

Karviná. Ostrava is between the two. But this battle of where to be was such that in Brno, The Technical University of Brno should be the university the faculties of which will be. That means the Technical University will have in Opava philosophical faculty. There was in August 1990 a meeting in Brno where the people from Opava and Ostrava were very hard in the discussion.

Burnett: Very active and involved in discussion.

Černohorský: [4-00:31:35] What to do? It was awful. I telephoned to my friend the Deputy Minister, Party, about this, and he decided there would be in Northern of Moravia two universities: one in Opava and one in Ostrava, and he said to Milan Jelinek, the then Rector, after Velvet Revolution, Rector of Masaryk University, Masaryk University should be the university where these faculties should be till the law for establishing universities is passed. So the situation was like this but it was necessary that the senate [4-00:33:00] of Masaryk University approve to having these two faculties. It was on Monday the 7th September and in October lectures should be begun. And the senate did not give the approval.

Burnett: Oh my goodness.

Černohorský: Yes, that was awful. The reason was they said we have at Masaryk University five faculties. And if we had two more then the money [4-00:34:00] will be disseminated—

Burnett: Divided amongst the seven instead of—

Černohorský: [4-00:34:08] The situation was bad and Milan Jelinek as Rector was very quick, and he had the right as Rector to hold a new session of academic senate on the 14th of September, one week after. One said, in vain, the result would be the same. My colleague from the Institute, Schmidt, was the leader in the senate, presiding over it. So I talked not only to him but to some people, members of Senate from other faculties, without making much publicity about it. It was not secret, but privately, yes? I explained to them. I said, “Please, what job are you doing if you have no information and you are you are making no effort to have good information? The situation is such that the money for new universities was at the Ministry. It’s for them and it will not influence the money for Masaryk University.”

Burnett: He invented that story? The story that adding two new faculty will suck money from the existing faculty was false?

Černohorský: [4-00:36:48] Yes, this was an argument and their argument was wrong. And then my argument was, “first of all, what do you think people will think of you in the future that you were against this when there is a region so neglected as for education. The public opinion predicted the result of the voting in the Senate would be the same now. Opposite result.

Burnett: So they voted for it.

Černohorský: Yes. I [4-00:38:00] haven’t publicized my interventions; it’s not necessary.

Burnett: Yes, but you and other people were arguing for it behind the scenes.

Černohorský: [4-00:38:24] Yes. So, of course, this Milan Jelínek, we were now interested in making it work. And so I offered to consult in Opava in mathematics and physics. People were surprised. They said to me, some of them, “Well, mathematics and physics in Opava. All right, but in the other faculty in Karviná Faculty of economy, “What is this physics and mathematics there?” [chuckles] I explained to them, “Physics, you are right. But, if this faculty of economics will be strong in mathematics, this could be the best economics education institution because mathematics is our fame. And so I consulted in Opava and this was the year 1990, and the semester began. In ‘91, the parliament in July approved establishment of the new universities. That means it would be necessary to make all institutions. For first of all, to have a rector, and so I was offered to be the rector of this unit.

Burnett: In 1990 they started classes in Opava. Is that right, in 1990? In 1990, teaching in Opava began.

Černohorský: Yes.

Burnett: Yes, okay, but earlier you said that they were adding two faculties to Masaryk University, for Opava and Ostrava, and that was the question or the problem. Did that mean that the administration of the teaching in Opava was by Masaryk University, remotely? Was it administering? Why I’m confused is, there’s teaching in the 1990s in Opava, but no university.

Černohorský: [4-00:42:52] Yes. I will explain. The situation was of course very difficult because in Opava there was nothing as for higher education, neither in Opava nor in Karviná. But when in January, 1990 the minister said you should begin in autumn 1990 to teach, then one prepared it, and there was some possibilities from Ostrava where there was a teachers’ college. That means it was necessary just for the first year. That means it was not necessary to have the full university. Understood?

Burnett: Yes, so they began to have some space, some teachers and they began slowly.

Černohorský: So it goes, and now I was asked to become a candidate for rector. I didn’t count this something right there.

Burnett: You didn’t count on that happening.

Černohorský: [4-00:45:04] No, no, no. No, you must imagine that this was already 1991. That means the rector’s appointment will be ‘92. That means sixty-nine was my age at the beginning. That means to be in the rector’s office already at 70 and more. Therefore, this was not my intention. And it was also true that there was a Professor Dostálek, who was Director of an Institute of the Academy in Prague and there he was also in the minds of some people. The candidate and I supposed this would be certainly so, and he visited me in Brno and I explained what I knew about the state, from the consultations, and it seemed [4-00:47:00] to me certain that he would become Rector. But, he had the intention to remain in his position as director of The Institute of the Academy in Prague and to be in Opava only one day a week. And many people said this was not acceptable.

And students wrote to me, came to Brno, and numerous delegations to me, and I wrote to the students and I'd explain to the delegation that, [4-00:48:00] while I feel for my health very well, it doesn't mean that it must be one or two years and it would be a risk with beginning. Notwithstanding, they insisted, and I insisted too, and the day before the deadline for submitting, I recognized that the situation is rather serious insofar that Dostálek now and if I [drop out], then [4-00:49:00] somebody from the local people without experience—I saw this. Therefore, one hour before the deadline, I signed. And I became Rector, with the explanation that we must seek out somebody younger and one year may be perhaps enough to have somebody. Another situation was another one. Three years the full [term], and then three years more.

Burnett: Six years?

Černohorský: Six years.

Burnett: Did you move to Opava? Did you live in Opava?

Černohorský: [4-00:50:13] Yes, these seven years, and when I was in Brno mostly not at weekends but, [instead] on the way to Prague. And it was so that I had to build up the university and when I consulted at the Ministry, saying “I will be rector. What about the staff of the Rector's Office.” “No, you must have some fifteen people for these various positions.” Paul, fifteen people in a fortnight.

Burnett: Two weeks to hire—

Černohorský: Good qualified people. And so what I did to have a questor [accountant, book-keeper], that means for the economic.

Burnett: Yes, a chief accountant.

Černohorský: Secretary. I was offered secretaries. These women were [4-00:52:00] very good in cooking, coffee. Now, I don't need coffee; I need a secretary who knows English.

Burnett: Yeah, administration.

Černohorský: And the rector's car, a driver. Yes, this I knew these are the three for the rector's office. Secretary and driver, these two hear and know everything, and hear and know nothing.

Burnett: Do you mean that they are someone who knows all the details of the operation—

Černohorský: [4-00:54:00] Some very special because we had already one year faculty were in life. That means faculty had their deans, and the deans had employees in their offices. Yes? And what do you think I did? I decided to have as pro-rectors, as vice-rectors, these deans, because then they have already people.

Burnett: Yes, their own staff.

Černohorský: [4-00:54:44] And this iteration, I must have had fifteen. And at the ministry they said to me “impossible.” Because this is a conflict of interest the dean a conflict. That is the faculty and vice-rector is in the interest of the university. And my argument was that the Silesian University must be a university where the dean is naturally interested in his security, but he must be interested in the university as a whole, and the vice-rector vice versa. “No, but the law doesn’t allow it.” “No, but I didn’t find any law.” Therefore I knew and said, “Please, could you tell me, what law?”

Burnett: Oh, so there was no law. Again, it was an argument that it was not based on fact.

Černohorský: [4-00:56:20] No I was all done. And I said, “That means I can do it. It’s not against the law.” They said, “I know you can do it but you will see that it will not function.”

Burnett: It’s a conflict of interest in this abstract form.

Černohorský: [4-00:56:43] I did it, and it functioned. Of course, these six years, I was weekends, any day, after midnight, at the *Rectorat* [Rector’s Office]. These years were devoted to the university because, well, you can imagine.

Burnett: I think I can imagine.

Černohorský: Yes, or maybe you can’t. [laughter]

Burnett: It’s inconceivable.

Černohorský: [4-00:57:40] Yes, but it had success. I was very successful. For instance, I had an agreement with such a university as Würzburg.

Burnett: Yes, can you tell me about that?

Černohorský: [4-00:58:00] My policy, so that’s my policy with Polish universities, my policy was not to set up agreements but to begin with common work, and I said to the rector of Würzburg University, “Please, let’s see what will happen if we work together, some people in Germany, and after one, two years, we will see.” And it was a success.

Burnett: So you began an informal relationship first.

Černohorský: [4-00:58:45] And as various as Herrmann Nierman Stiftung, German library, 10 million I got from them. Yes, it was a negotiation. And sometimes foreign visitors came and I overheard: “The university is five years old is what we have heard. We can hardly believe that it’s possible in five years to have such results with establishing a new university. Please explain and we would like to see how it was worked.” Of course, it was not easy. Yes, but no let’s leave this. I wanted just to explain to you this establishing and building up a university. For instance, the mathematics department is smaller than the Mathematics Department in Charles University. But as for the efficiency, on the same level.

Burnett: [4-01:01:00] Right, in terms of producing quality student outcomes.

Černohorský: [4-01:01:03] And personally I could be satisfied with what happened because for instance, the director of this mathematics department, when he was offered a job, he came to Opava from Bratislava and had offers to go to other great universities. Why was he going to a beginning university? And it is not bad to hear that he decided to go there because of their rectors.

Burnett: Ohh, that's a nice compliment!

Černohorský: Because I was interested to support the quality. Yes. No, that's a chapter from the higher education institution, post-Velvet Revolution time.

Burnett: [4-01:02:50] Yes, educational reform, so you thought outside of the conventional norms or rules. People said "No, deans must not be the same as the academic administration" and you said "No, forget it. This is a special case. We must be experimental and we must attempt to try something new," which is the opposite of fifty years of bureaucracy, convention, norms, stasis, not changing, and you, now, who have been on the outside, have an opportunity to say, "Embrace flexibility. Embrace change. Look at possibilities. Do not assume that there is going to be failure; assume there will be progress. Assume there will be success, [4-01:04:00] and make the institution fit the problem. I think that's what you were exploring.

Černohorský: Very precisely formulated.

Burnett: Do you know how many students per year are at the University of Silesia?

Černohorský: I don't know the present situation, but it's several thousand.

Burnett: That's a very good number for a regional university. That's great.

Černohorský: [4-01:04:47] And what's important, just in the last few days, the Ministry [of Education] decided to have for financing research at the universities, to divide the universities into four segments: one segment is to state universities. These are for policemen and for the army. Another is the schools for the arts: music, drama. These are not scientific, but of these we have four, and these twenty-four public universities are in two segments: Charles University, Masaryk University, and Palacký University; and Technical University, Prague, Technical University, Brno, and another segment holds the others. I find it a success that these new smaller universities are not a special segment. But speaking about this College of Art, I would like mention something which is important for the general policy of financing. First of all, I must say that I founded the Rectors' Conference. It was something very special in that year.

Burnett: What year was this that?

Černohorský: The rector of the smallest university and not the rector of Charles University founded this conference. [laughter]

Burnett: What year did you found the Rector's Conference?

Černohorský: [4-01:08:00] After the Velvet Revolution, as I mentioned already: the Club of Rectors of Czech and Slovak—and first all, the rectors were members of this

club and president of this club became Milan Jelínek. It was so that after the Velvet Revolution the support from outside Charles University. But they were clever enough. And for instance, I had in my resolve, let's say, what to do with this support, negotiations in Brno. And rectors of the Charles University said it is not necessary that all is in Prague. "Let's have the seat of the office of the Secretariat of the club in Slovakia, not in Prague." And these gestures were repeated from the Slavic side: "It's not necessary that it must be Slovakia; let's have it in the middle of the state, in Brno." So Milan Jelínek as Rector of Masaryk University now established the office. But organizing things is not his strong side. It was on me. That means I had to, and so I engaged Dr. Fojtíková for one year or so because she was a very able physicist in scientific instruments. So sometimes I said to Marie it was a mistake that Czech physics could have had an excellent physicist in her, but she is so successful. In the international negotiations, what she has done and is doing for these jobs is wonderful. and so we established this office and I saw that the division of the state of Bohemia-Moravia and Slovakia is near. Therefore, I proposed to have in the club two sections: section of Czech and section of Slovak. I had this office of chancellor. I was the chancellor of this club and I said we must transform the club to a conference to be compatible with other European countries. But there was a rector who was in opposition to it.

Burnett: Why?

Černohorský: [4-01:13:36] Because, "No, let's have the club. We must be free. If he is used to have this then we will be not so free," and so I explained to them, "Please, but we will be asked for opinions. Maybe sometimes it would be necessary to vote for what position to have." And he said, "To vote? Voting is for a rector."

Burnett: That mentality.

Černohorský: [4-01:14:52] So now nevertheless I wrote the statute of the Czech Rectors' Conference. And I was patient. The time will come. And January 1991, the last days of the plenary session, the state was already divided. The Slovaks, they had already transformed the club into a conference. We [still] had the club. I was Chancellor, let's say, vice president of the club, and the president said to me – it was a session in Prague—"I have something to do I will be from the beginning until 2 pm not at the Technical University. Please be so kind and begin without me." And he came, was not too late, but in the meantime, I begin exactly at 2 pm and voted on the program. And the first program: information on the statute of the Czech Rectors' Conference. No objections. Why? Objections? Nothing. "That means agreement with this?" Yes? So I declared. That means that in this moment our session of the Club of Rectors of Czech Universities went over into the first official session of the Czech Rectors' Conference. And when the president came, I said "I welcome you to the first session, so I was the founder."

Burnett: That's wonderful.

Černohorský: [4-01:18:19] Financing, this art, it's something different in these high schools of art, because you can have one hundred students in a lecture of x , but you can't have twenty student violinists. And some rectors said "No exception. Higher education is higher education." And that was hardly acceptable. So what I did, I prepared as Chancellor what to do with the money and said to the others, "Please, you may count how you will be influenced with your score when we give to these colleges of art not twice normal, but three times what they knew. No influence for so small [an expenditure]. In

such a way, you can have good decisions. This was a few items of experience from my rector activities.

Burnett: [4-01:20:41] And a successful time. What's clearly at stake in the foundation of the new universities was a debate about access of students from regions that had no access to university education on the one hand. The other is quality, right? This is quality so for education in general is to basic needs access. Can students go to university? Is it possible? Is it available? Is it closed? And quality. Excellence. Is the education of good quality? So, in Opava before, no university, so students did not have a local university to attend. The effort was to bring university education access and excellence or quality. So those are two important elements. In many debates about education, these two qualities some people say it's access *or* quality, but not both, and you in your work you were working for access *and* quality. It's not one or the other and that was the approach that you took that is your orientation to the problem.

Černohorský: [4-01:23:03] Unfortunately, if the ministry takes something like that, the financing of the university will be according to the number of students, then the effort is to have so many students. And I know such examples that a person enrolls, inscribes. Let's say he asks, "When I inscribe, is it clear and is it certain that I will be the whole year just as a student of the university?" Because it's sometimes the case when a person has no interest in studying, but wants to have for one year the status of a student. Yes? And so I know these cases that the highest academic officials do not agree that students must have some examinations after the first semester. They prefer after the whole year, because after one semester, if he's not studying, all the money for him is cut. Of course, the decision of the ministry is bad, but what is worse, that the situation in the schools be bad? Yes, and the way is what I explained about these famous architect, Aleš Jenček. But if there is no hope, then please, choose another way.

Burnett: Right, choose another path. Yes. Well, on the subject of access you were involved in a program for a scholarship for physicists. Can you talk about that program?

Černohorský: [4-01:27:00] Yes. This scholarship is different according to the individual universities, and even at this moment to have more student sand to have maybe good students that the universities pay to students with good grades to enter the university.

Burnett: With good grades?

Černohorský: [4-01:27:51] Yes. And it's connected also then with various scholarships in this respect. I mean as special kind of scholarship is the Georg Placzek Scholarship.

Burnett: Yes. Can you tell me how that was established the George Placzek Scholarship. Can you tell me how that was developed?

Černohorský: [4-01:28:30] First of all, I must say that it was the idea of Tony Placzek, to do something for Brno universities because the Placzek family owned several houses in Brno. Unfortunately, the terms for restitution was expired. It was not effective enough.

Burnett: You are referring to the Holocaust?

Černohorský: [4-01:29:21] I'm talking now about Tony Placzek. Yes, it is connected with the Symposium in 2005 to celebrate two anniversaries of George Placzek, one hundred years since his birth, and fifty years since his death. And Ales Gottvald, and before him, Jan Fischer, from The Academy of Sciences of Prague, from the Institute of Physics, were active that Georg Placzek has a great importance. In this Year of Physics in 2005, the Brno branch of the Union of Czechoslovak Mathematicians and Physicists prepared the unveiling of the plaque connected with this symposium. Unfortunately, there are not proceedings from the symposium, but the symposium itself was very successful. It was great success in that various members of Placzek family were here in Brno and Tony Placzek, let's say their spokesman. And I must say what he said and all what was connected with him was the best certificate. You had, let's say, a university professor in action. When we were speaking with him, it was his intention to give some of these houses to Brno universities and to have in this house something like a cultural [space], something very useful. But as I said it was too late for the restitution.

Burnett: I should just explain, when you're talking about restitution, some of the family perished in concentration camps and others escaped the Nazis, and so the restitution claims were about the Holocaust and so that's the reason for that.

Černohorský: [4-01:33:53] It should have been sooner, but the intention of Tony remained, and so Dr. Fojtíková in the negotiations, and then we three—Tony, Marie, and me—and so it was a good idea to have a scholarship with the name George Placzek Scholarship. It's a token of esteem more than money. It is not very much as for money, but the main effect is that it remains on George Placzek, and people who win are very successful. It's the best students in physics.

Burnett: And they are for students in the first year of university?

Černohorský: [4-01:36:00] Before. It's for students who intend to go to a university to study physics. That means their qualification must be from the *gymnasium* and for these various activities before university.

Fojtíková: [4-01:36:35] These were students who finished secondary school and who were accepted at university.

Černohorský: Of course. No, the scholarship is for a student of university.

Burnett: Yes, but from high school applying to university.

Černohorský: Yes, that means the student has the decision to study physics and this procedure is finished. That means he is accepted to a university, and in that case he is entitled to get the stipend.

Burnett: What year did the scholarship begin?

Fojtíková: [4-01:38:21] The first scholarship was awarded in 2009.

Černohorský: [4-01:38:27] 2009 is the first, so it will be next year the 10th anniversary.

Burnett: Doctor Černohorský, I want to take this opportunity to thank you for sitting with us to talk about your life and your career—

Černohorský: [4-01:39:05] It was a pleasure.

Burnett: And your commitment to excellence and access for students in the Czech Republic for these many years. Thank you.

Černohorský: [4-01:39:17] Thank you, too. It was very agreeable to be with you.

Burnett: [5-00:00:00] This is Paul Burnett interviewing Martin Černohorský for the Martin Černohorský oral history project and it is November third, 2018 and we are here in the offices of the Rector of Masaryk University. And this is session number five of the project and welcome, Dr. Černohorský. I want to begin—because in July, we had sessions about your life from beginning to today sessions 1 through 4—and the purpose of our sessions this weekend is to add more information about the same span of your life. So we will return to an earlier part of your life in this session and follow through up to session eight with the most recent part of your life.

So I would like to return to Czechoslovakia in the late 1930s, and you are fourteen, fifteen years old, and I would like you to tell me about the experience of the invasion and occupation of Czechoslovakia. Can you tell me from your perspective as a young adolescent? What did you see? What did you experience?

Černohorský: [5-00:02:37] The situation was rather complicated, more complicated than I could at my age grasp. But nevertheless I had some experiences which are characteristic for these times. First of all, I didn't understand, of course, the meaning of the black day in New York in the economy in 1929?

Burnett: [5-00:03:31] Yeah, the Crash.

Černohorský: [5-00:03:33] But in the thirties I began going to the *gymnasium*. And also in this year, I had quite a special experience because we had the favor to be given something to eat, and it was I who was going to take it and to bring it home. Yes, and there were many people there, and I could follow the discussions of these socially very indisposed people who said what they are feeling about what is going on, yes? It was a very good “school.”

Burnett: [5-00:04:51] And this, was it at the gymnasium or it was social service? It was, in English we say “soup kitchen.” Was it a place a central place for food?

Černohorský: [5-00:05:09] It was nothing to do with *gymnasium*, yes? Quite a municipal [institution] for various people who needed—

Burnett: [5-00:05:23] But who needed food; they distributed food.

Černohorský: [5-00:05:26] Yes. Yes, no money. But they received food. A special group of the society, let's say and then of course in *gymnasium* I had other experiences because I was engaged as home teacher [a tutor], let's say it's so for my schoolmates.

Burnett: [5-00:06:08] A tutor. Yeah.

Černohorský: [5-00:06:09] Yes, and this was the opposite; this was people — doctors lawyers — people with very good positions in society. Yeah, not all, but most of them. Yes. That was my, let's say, social experience. As for politics, I remember very well Munich.

Burnett: [5-00:06:47] Munich Agreement?

Černohorský: [5-00:06:49] Munich agreement. We were prepared to fight. I, as a boy, was with many others to help in some way. Unfortunately, [UK Prime Minister Neville] Chamberlain and others make ... and then came, not only Munich, but March the 15, '39, I remember that day very well. *Rechtsfahren*, [a new right of way was decreed] on the radio. Yes?

Burnett: [5-00:07:49] What is *rechtsfahren*?

Černohorský: [5-00:07:52] To drive to the right, because there was [before] to drive to the left.

Burnett: [5-00:08:05] Oh, it was an English system?

Černohorský: [5-00:08:09] But in Germany, it was on the right and we were occupied. I was so naive that I said at home, "That's not possible. It would be necessary that our assembly..."

Burnett: [5-00:08:37] Would approve the change.

Černohorský: [5-00:08:39] Yes. But, so was my experience a very bad one. Yes?

Burnett: [5-00:08:57] So, March the 15th, 1939. Can you tell me about this?

Černohorský: [5-00:09:09] The *gymnasium* was very important for me as for what I would like to study after *gymnasium*. And it was mathematics, and the reason was even this work with my schoolmates and because I had the feeling that mathematics is something that is perfect; one can understand all without any gaps my experience from school. And so it's strange that I became a physicist, but this is something which is to be explained later. The end of *gymnasium* was 1942. This was [due to the work of Protektor Reinhard] Heydrich.

Burnett: [5-00:10:40] Right. This is the Heydrich who was the *protektor* or the ruler of the protectorate. [Deputy Protector of the Protectorate of Bohemia and Moravia under the Nazi regime].

Černohorský: [5-00:10:51] Yes. And politically it was very important, and could be used very well by our London government, by [Edvard] Beneš, but in the *Protektorat*, as one said in those times, this was unfortunate. Many people were killed, yes? And in this atmosphere, I ended my *gymnasium*. And what happened before that was in November the 17th, '39, our universities were shut. This was the famous case in which students were, during a demonstration, killed, shot. And the universities were shut officially set for three years that means '42 ending *gymnasium*, and now one could expect that the universities will be open, yes? Nothing like that. Instead they said it would be possible to study outside of Czechoslovakia, in Germany. And already before '42, in these three years, some students of medicine used this possibility. But this was not known to me. And I was very interested because of our situation in the family at home, not to be in danger to have to go to work in Germany. And so I consulted, I asked my *gymnasium* teachers what they thought about this possibility. This is a rather complicated study; I will say it very shortly. The result of this consultation was that I was among these about 5,000 students who

applied for the admission. And from these five thousand, twelve hundred studied in Germany.

Burnett: [5-00:15:23] So out of 5,000, 1200 were accepted.

Černohorský: [5-00:15:29] I didn't expect that I could be admitted because I have not geometry at *gymnasium* and so I was entitled to go only to university and not to Technical University, and mathematics, which I had taught, was only in the Technical University. So I expected it would be refused but I would gain time. One must know that it was already the time of the Battle of Stalingrad and one could expect that the war would finish very soon. The end of Stalingrad, the capitulation of the German Army in Stalingrad, that was in January '43, so it was quite realistic to do. Nevertheless, the fact is that I was admitted and I was partly in Darmstadt, partly at home. It was rather free for me, good also because I was very soon engaged by Professor Alwin Walther, who was director of The Institute for Applied Mathematics, a famous Institute and a famous Professor. And so I had some advantages.

Burnett: [5-00:17:45] Were you concerned about your family? Let me ask this: if you had stayed in Czechoslovakia, and not gone to Darmstadt—

Černohorský: [5-00:18:04] Yes.

Burnett: [5-00:18:06] —would you have been able to earn money to support your family?

Černohorský: [5-00:18:16] It's so, if I would be, let's say, transported to Germany to work there, nothing like coming home, and nothing earn money, which was my possibility in two countries. When I was in Germany, I taught there some people. Some of them were very interesting cases, I mean politically, as for the attitude to the situation, and when I was at home during vacations and otherwise, I continued with my clients at home.

Burnett: [5-00:19:15] So you were able to support your mother.

Černohorský: [5-00:19:22] Yes. Of course, this was the agreeable part. On the other hand, the shadow, the reaction to shutting our universities, this is something which the [Czechoslovak] society didn't accept. And one must understand it, and therefore it was quite correct. Then, after the war, these students who were in Germany and were not admitted to study [in Czech universities] without any negotiations, yes? And there were commissions at their faculties. And these faculty commissions who applied but didn't [were not allowed to] study. And for those who applied and were admitted and studied there was in Prague and in Brno. I don't know the correct ... tribunal?

Burnett: [5-00:20:58] A tribunal.

Černohorský: [5-00:21:00] Tribunal for morals and ethics.

Burnett: [5-00:21:09] Ethics.

Černohorský: [5-00:21:10] Yes.

Burnett: [5-00:21:11] Yes. Ethics tribunals to determine...

Černohorský: [5-00:21:15] Yes, and they said, “Please, nothing like that. Now begin to study here. You can begin, but after one year or after two years.” In my case, it was a special situation because the commission, specifically the Faculty, was informed by my *gymnasium* teachers about the special situation in our family and I was allowed to inscribe [enroll] immediately, but I insisted. I refused this benevolence [exception] and I insisted there must be this [tribunal].

Burnett: [5-00:22:32] Can I ask you, why? Why did you refuse to accept this?

Černohorský: [5-00:22:42] I didn’t want any exception. And first of all, I would like that the matter of fact be known that it was not my interest to have some advantages as for studying, right? Yes. That was the social situation. In the family with some special features very special not to speak about, and therefore I had not the feeling that I have done something inappropriate.

Burnett: [5-00:23:35] I don’t want to ask you to specify the family circumstances, but I think it’s important to be clear that you as a teenager were responsible for the support of your family. That’s correct? So you felt you had a responsibility to help your family to survive. Is that true?

Černohorský: [5-00:24:13] One can say something like this. And there was another thing: I was asked to become deputy director at one of the homes for children where I was [living] in my younger years, it was naturally nothing that I was glad to do generally, because I wanted to study, but it was clear that I had something I felt like my duty. They helped me when I was a boy. It’s adequate [or appropriate] that I helped other boys.

Burnett: [5-00:25:34] Can you talk to me about duty. Duty is important to you. Correct?

Černohorský: [5-00:25:46] The feeling of duty, which is very different. Many people wouldn’t *feel* as a duty something. What I have is something what one *must* do.

Burnett: [5-00:26:12] It comes from inside.

Černohorský: [5-00:26:15] Yes, this attitude, this is a quite personal approach. And so I was entitled to finish my studying in a very short time, in two years or something like that.

Burnett: [5-00:26:43] If you had accepted [the offer].

Černohorský: [5-00:26:45] If you accepted, yes, and after that and I ended my studying of five years. Of course, in these five years, I was already also [working] as a research student or something like that, an auxiliary member of the Institute and then an assistant. And I had already not only laboratories but also, as a student, I lectured already and my end of [undergraduate] studies was 1950. And in 1948, I became a member of the commission for the reform of the curriculum and the philosophical and natural [science] faculties. This was rather a strange story because the professors of physics were at that point not in an acceptable position for the high-power politicians. Mathematics,

chemistry, biology: the most well-known people, the academics. And for physics? A student.

Burnett: [5-00:29:04] Okay. So were you the only representative from physics?

Černohorský: [5-00:29:10] Yes, in this commission.

Burnett: [5-00:29:16] Yes, and you were twenty-five?

Černohorský: [5-00:29:21] Yes.

Burnett: [5-00:29:22] Twenty-five years old.

Černohorský: [5-00:29:24] No, very strange.

Burnett: [5-00:29:26] Well, let's pause.

Černohorský: [5-00:29:31] So that's quite a short description of this war, and to join another thing: This was the situation where one said in Germany, some people believed that their Führer "*hat eine geheime Waffen.*" A secret weapon.

Burnett: [5-00:30:13] Okay.

Černohorský: [5-00:30:15] It was nuclear fission, yes? And in this connection what's very important for us and first of all Brno: George Placzek. But this is of course a topic which I would not in this connection explain.

Burnett: [5-00:30:56] Just to be clear, you're saying there was a rumor? In Czechoslovakia or in Germany, there was a rumor or a story about a secret weapon, that the Führer Adolf Hitler had a secret weapons program?

Černohorský: [5-00:31:19] You know, Forty-four, at the Second Front, in the West?

Burnett: [5-00:31:30] Yeah, in June of '44.

Černohorský: [5-00:31:31] Success in France?

Burnett: [5-00:31:37] Yes.

Černohorský: [5-00:31:37] Yes.

Burnett: [5-00:31:38] Yes.

Černohorský: [5-00:31:39] That means the war is lost for Germany. Yes? Yes, but some people believed the war was not lost: "Hitler has a secret weapon in Peenemünde."

Burnett: [5-00:31:55] V2, V1 [rocket] programs. Yes.

Černohorský: [5-00:32:04] Of course, I spoke about these things with people, not only with Czech people, with German professors.

Burnett: [5-00:32:20] Yes, and they believed it?

Černohorský: [5-00:32:23] That's clear that Germany was Hitler's Germany, but this doesn't mean that all Germans and especially University, as Darmstadt University, Technical University was an international University, well-known, something similar like Cambridge or Oxford in England. Yes? So the attitude and the atmosphere is something I could follow. For instance, I attended psychological/ philosophical seminars, and I spoke privately with these lecturers, with these professors. Yes? The picture is quite different from what is possible to see from inside of Czechoslovakia.

Burnett: [5-00:33:49] Yes, so you had a sympathetic experience of the educated Germans — international-minded, progressive, and it influenced you. And we were talking about duty. So in this time, [you're a] young man, very young man, and in your world, the duty is national, right? Duty is to nation or to politics. The duty is to Communism or to Nazism or to democracy. And you are, not by choice, you are in a position between these structures, between Czechoslovakia, between Germany, between communism, between fascism. You are an in-between person not by choice, but by circumstance, is this correct?

Černohorský: [5-00:35:04] Yes, therefore it was very important, and it explains why I understood so well what happened in '48, when a totalitarianism of another kind came [to Czechoslovakia]. I knew already all of these techniques, yes, and what people are doing to survive and some opportunists, some who knew very well their human duties. Therefore, it was for me a great advantage to be well-oriented in the situation after '48 [the Communist coup in Czechoslovakia in 1948].

Burnett: [5-00:36:08] So in your life. It was important to be—you had to have an internal direction, an internal code or way to behave in society. You had to because there are too many ideologies, structures, philosophies that demand a total obedience or a total set of ideas and behaviors. And you could not trust these ways. I think I may not make myself clear.

Černohorský: [5-00:37:15] And now the years after '48, some of my teachers were victims of the regime, and I was in a very close connection with one of them. I was every day in evenings with his family. He was fired.

Burnett: [5-00:37:55] In Czechoslovakia.

Černohorský: [5-00:37:56] In Czechoslovakia, now I am [talking about] after '48.

Burnett: [5-00:38:05] Yes. Let's talk about the context. So 1945 is the end of World War Two, but 1948 is the period of the consolidation of the Communist Party in Czechoslovakia. And the power is very strong of that party and they begin a period of reform. From 1948 to 1950, can you describe the consequences of this reform in 1948? People were fired.

Černohorský: [5-00:38:57] What kind of reform do you mean, politically or in education at university?

Burnett: [5-00:39:04] Both, both, but right now, the larger political transformation.

Černohorský: [5-00:39:13] As for the first, I had of course these disadvantages, because normally one could not expect that people would know the result of my tribunal. Yes? This is a very special thing that in October, '45 the result was declared, and I had been acknowledged with the past semester, spring semester, '45. This was a very special semester with a few weeks after Brno was free in April, '45, and the remaining few weeks were declared a semester.

Burnett: [5-00:40:38] So they opened the university right away. And they said, "We will have a semester."

Černohorský: [5-00:40:45] Yes, this great, let's say, success for me was known to people in offices and so on. For them, I was one of those who was in Germany for studying, and therefore, it was so strange that at the same time, I became a member of this state Commission of Reform.

Burnett: [5-00:41:26] So it was complicated for you. So did some people think that those who studied in Germany were, not collaborating, but—

Černohorský: [5-00:41:42] Yes, something like that, yes.

Burnett: [5-00:41:45] —participating in the domination of the nation by the Nazis.

Černohorský: [5-00:41:53] Yes. Naturally, in my next surroundings the situation was clear. So back to your question, politically, the power very strong. We had an electrician at The Institute who was a delegate in the famous February meeting in Prague where 2,000 representatives from the works, factories, or institutions were dealing with this coup, let's say, and who is for this proposal? And these two thousand people, except for 12, and our electrician was one of those 12.

Burnett: [5-00:43:22] Who said no?

Černohorský: [5-00:43:23] He's [among] those who were against: 12. And what happened then? Awful. Yes. This mass of these 2,000 people. So, it is not astonishing that when the activists came to you, "Please, sign, you go in the party." Then you signed, yes?

Burnett: [5-00:43:58] It grew so quickly. The Communist Party had 25,000 members in one year, then 1.2 million in months!

Černohorský: [5-00:44:10] Nah. No. That was the technique, because if you say no—

Burnett: [5-00:44:20] Then it's bad for you. So can you tell me specifically, if you said no, you could be fired from your job? What would happen to you? If you said no, what were the consequences?

Černohorský: [5-00:44:38] This varied from place to place. Some were nothing and some were, not maybe immediately, but in any case, nothing for the future. That means you may be as capable as you wish, but if you deny it [the Party]—

Burnett: [5-00:45:19] Let's be specific about the transformations of Czechoslovakia in this time. So World War II and the Nazis: the Nazis removed the Jews, most of the Jews from Czechoslovakia.

That's one step. Second step, after World War Two, there was a repatriation, a removal of Germans. German-speaking people were removed from Czechoslovakia, to Austria, to Germany. So that was also a kind of a—

Černohorský: [5-00:46:02] Three million.

Burnett: [5-00:46:02] Yes. And many Germans and many Jews were professionals; they were educated and they were skilled. They were doctors, lawyers, administrators, managers, and they were gone. They left or were taken or they were killed, and so in Czechoslovakia, there is an absence of people who would be skeptical of the techniques that you described and so you have many people from the country, in the farms, coming to the city to take positions in industry. So this war and the post-war period is a big transformation of Czechoslovakia.

Černohorský: [5-00:47:12] Yes, these were very important changes in the culture of Prague and, not as significantly, but also in Brno, the area was not a unique Czech, but in Prague: Czech, German, Jewish, yes?

Burnett: [5-00:47:56] Yeah, it was multicultural.

Černohorský: [5-00:47:58] Yes. Multicultural society. Franz Kafka. So, the influence of the party was a great one. I have some cases as a teacher because just one of my students or in the first year of studying his father had a good position in the party and for his son. He was already sure that when his son finished his studies, he would become the director of a *gymnasium*.

Burnett: [5-00:49:07] Yes. This was this was later, right? This was later in your time.

Černohorský: [5-00:49:12] Yes, and some similar cases. In the university life was another situation, because there were some economically interested and another one, “why do something with the study programs?” For instance, at these philosophical and natural faculties, the students, after having their diploma, were all going to be secondary-school teachers instead of physics for industry, chemistry for industry. And one said we must do something. In '50, a congress about physics and chemistry in industry was being prepared in Brno, a great congress. It was something which was created in chemistry, among chemistry people, but after one year of preparation, nothing had come of this. But this reform of the curriculum that we had done not only for teaching, but also practices for industry, this was done.

Burnett: [5-00:52:06] And the context is, before the war, Czechoslovakia was trading with other countries, industry, like the Placzecks. They were part of the wool industry, so they sold materials to England, to France, to Germany.

Černohorský: [5-00:52:33] The position was lost. Because we do not need to collaborate with these capitalist countries; we have the Soviet Union.

Burnett: [5-00:52:50] And the Soviet Union, Stalin, was very suspicious of contacts with the West. It was a danger. It was a security problem, right?

Černohorský: [5-00:53:06] Yes.

Burnett: [5-00:53:07] And so when so Czechoslovakia loses markets, loses the reason for industry, the reason to produce is gone, has disappeared.

Černohorský: [5-00:53:23] Yes.

Burnett: [5-00:53:23] And so in 1948, the Reform Commission is about how do we restructure our economy and our education system to produce the people for the future economy of Czechoslovakia. Is this correct?

Černohorský: [5-00:53:47] Yes, it was decline from the Western countries, and absolutely in one direction, to the East, to the Soviet Union.

Burnett: [5-00:54:04] The industry would produce materials for the Soviet Union and the Soviet Union would be the customer.

Černohorský: [5-00:54:17] Anything after the proposal coming from experts from the Soviet Union.

Burnett: [5-00:54:28] Yes. Can you tell me, so, the experience after the war, was it difficult to have food? Was it difficult to get materials for life? How, in the 1940s into the 1950s, was it? Was it better or more difficult? I'm trying to think of your comparative [circumstances], because, in the Great Depression you grew up in difficult economic circumstances. In your childhood, in your adolescence, it was difficult; the war, it was also difficult, after the war, it was difficult too. I'm trying to find a comparison for daily life after the war. Did people have food, did they have apartments for the daily life? How did people survive after World War II in Czechoslovakia?

Černohorský: [5-00:56:22] I'm [not] sure that I understand quite well the question.

Burnett: [5-00:56:33] The question is, before, in Czechoslovakia, it was a market system. You want an apple, you go to the store, you purchase an apple. After World War Two? That system is different. How is it different? You still have apples. Do you go to the store purchase an apple? What happens to the system of exchange, of markets?

Černohorský: [5-00:57:20] As for the greater economy, I am hardly qualified to give an explanation. This is not something which I understand from a professional point of view. What I can say is that those people I spoke about being given food, these groups of people were now preferred. And you must imagine what it means to have all these Germans who were outside Czechoslovakia, their properties, these "enemy" properties were here. And so there were these slogans: "All will be gratis."

Burnett: [5-00:59:07] Right, everything is free: free food, free apartment. So the Germans killed the Jews. The state removed the Germans from Czechoslovakia, and the state took those properties and distributed the properties.

Černohorský: [5-00:59:36] And an accompanying feature was that the people were told, “now the power is in your hands.” I had my students who once consulted with me, “and what about the conclusion [of the course], some examination or something like that with the laboratories in physics?” And I said, “yes, we’ll make a test or we’ll make some discussion about this, with you and your colleagues.” And the leader of the circle says to me, “yes, but we didn’t want it like this.” And I asked, “and what would be your wish?” Now, we were all together, our group. [The student continued] “You will ask a question and one of us who knows will react and this will be instead of your individual [evaluation].” And I surprised this young lady. I said to her, “Well, I agree.” She was surprised. But I followed my question, “And have you an index for your group?”

Burnett: [5-01:01:46] Index?

Černohorský: [5-01:01:47] Index: a student knows where the notes are.

Burnett: [5-01:01:53] Oh, yes. “Do you have a ‘grade book’ for your group?”

Černohorský: [5-01:02:00] She was surprised. “No, no.” “Whether you have an index for your group?” “No, every one of us has his own.” And I said, “Yes. I’m sorry, in that case where you will have my signature in your personal index then it must be a discussion between me and you and not between me and the group.”

Burnett: [5-01:02:48] So I want to make sure that I understand the story, that the students proposed a system of evaluation, that the group, the collective, receives a grade for their performance. So, as a group we discuss and if someone in the group has the correct answer the whole group receives the correct grade.

Černohorský: [5-01:03:22] Yes. Yes. Quite.

Burnett: [5-01:03:23] And, your response was that we will have one grade for the group. And she said, “No, we each of us has an individual grade book.” And you said, “Well if that’s true then each person receives a grade in response to their participation or their achievement.” So was the larger communist politics influencing the students and influencing the education culture? Is that right?

Černohorský: [5-01:04:12] Yes. Yes.

Burnett: [5-01:04:13] Wow. Today there are universities in the United States which do not give grades. And there are movements today saying that grades are harmful to the student because the student is told, “Oh you are a lower level than the other,” and that it harms them. So how do you feel about those systems?

Černohorský: [5-01:04:54] One must fight with it and one can be successful if you are helpful to the students and if you give to the individual self-confidence.

Burnett: [5-01:05:28] Yes, exactly. But it’s an example of how an ideology influences education.

Černohorský: [5-01:05:44] Therefore, I preferred always to do something what the students need, not to feel as his duty. There are some official programs, but I can say,

“Please, not only what is in our program. Whoever is interested can come on a Wednesday at 16:00 for two hours and we will do this and that.” Sometimes it was known as ‘scientific circles.’ And I said you can go in at any time, not necessarily from the beginning; you can go out at any time, as you wish.

Burnett: [5-01:07:07] So you said the requirements of the education are not enough, and you created a supplementary educational experience outside of the grades and outside of the evaluation. And so something for scientific curiosity?

Černohorský: [5-01:07:40] The students must feel it as his privilege be allowed to attend, not a duty, a *privilegium*, something that other students have not. This is so because when I have these eligible subjects [electives] and we have a system where, during the first two weeks [of school], the students are entitled to change. That means he subscribes [enrolls in] several subjects, and after that from six, he elects only two after these two weeks. I am asking to those who are there, why do you elect? Yes, very interesting reactions sometimes. Most of them [say], “In other subjects, we get knowledge, facts. But with you, you prefer thinking; not facts, but to ask why?” Yes, or there was an answer, “Because I see that you do this with pleasure.”

Burnett: [5-01:10:02] That’s important.

Černohorský: [5-01:10:04] Of course.

Burnett: [5-01:10:04] Very important! So you created a culture in your classes. You wanted them to feel what you feel, which is curiosity, satisfaction, pleasure. The student will not do the course to complete an obligation, to complete a requirement, to achieve a particular grade in a book; you wanted them instead to embrace science, to ask questions, to be stimulated by exchange of ideas with other students and with you. So you created a second level in the class that’s optional. It’s a choice to participate and they had experience of freedom to choose or not choose this.

Černohorský: [5-01:11:25] And to bring them to a state to be proud that they knew something that the others don’t know. It’s of course rather difficult in some cases, but it’s very successful method. When you explain so that the students understand it, why are [Werner] Heisenberg or Max Von Laue not correct with the explanation of Einstein’s relation mass energy [mass energy equation $E=mc^2$]. That’s unbelievable that Heisenberg or [Max von] Laue could not understand it, impossible, and if you explain what the point is they are very satisfied to know something special.

Burnett: [5-01:12:43] Yes, and it’s an example of very great scientists who disagree, which is interesting because in school, in the lower levels, the teacher is always correct. The scientist is the expert at the top and all you need to do is obey and absorb the truth from The Authority, which is very different from the society in which they [the students] are living where the Party says. “This is the truth.” So let me ask you: is science a type of politics? Is science a way of thinking that can be transported to a political world?

Černohorský: [5-01:13:54] Yes, I can give an example. When one says these ideological methods should be presented also in these professional subjects, then I gladly agree. And I took, it’s already many years when Marxism was a subject and the lecturer was not satisfied with my group. They said at the consultation of teachers of the first year of study

that there are difficulties in discussions with my group because I took a classical [education], I took Hegel, and I read: the scientific worldview is to understand nature as it is without ingredients from outside.

Burnett: [5-01:15:54] From politics, so to understand the world as it is, not as you want it to be.

Černohorský: [5-01:16:06] Yes, and they [the students] used it in the discussions and the lecturer said to them something they didn't agree with, that it is an ingredient from outside. [laughter] It's not a scientific worldview.

Burnett: [5-01:16:34] Interesting. When was this? What year was this?

Černohorský: [5-01:16:37] This was fifty-four, fifty-five. This was a bad time. But I see you asked something about World War Two and now we are speaking about education, but there are connections in this respect.

Burnett: [5-01:17:23] Well, I think the what we are talking about is that Marxism is an ideology which takes science as its tool. A Marxist ideology wants to be a scientific understanding of history, and it holds that science is the way of understanding our political world. But it's very rigid. It does not look at nature as it is; it imposes a structure on the world and says it is this way. In the famous cases in Soviet science, the Soviet view of biology, for example, they were not interested in genetics because genetics was too slow. Lysenko [Lysenkoism] was a popular scientific way of understanding things because they wanted to believe that human beings could change quickly, and the natural world was too slow. So it's a another subject, but all this to say that the Marxist view, what was supposed to be scientific, was a worldview that was prescriptive. It imposed a structure on the world. It was not, as you say, it was not exploratory. It did not ask questions of nature; it imposed a structure on nature and said this will be what we want it to be. It sounds like the authorities did not like teaching or bringing Hegel into the student classroom. So the students you had questioned the authority of the other teacher. Is that what happened with the students in your class in their study of Marxism? They took what you taught them and applied it to this other class and the teacher was not happy. Is that what happened?

Černohorský: [5-01:20:50] [chuckling] Yes. Yes. Some of them are also reasonable Marxists.

Burnett: [5-01:20:59] Yes. Well, like you said, in Germany there were people who recognized that [Nazism] is an ideology. They recognized that it was. So in this period you are also doing some early research in 1948. You did some collaboration with a factory in—

Černohorský: [5-01:21:32] Vitkovice.

Burnett: [5-01:21:34] Which is near Ostrava. It's in the steel-producing—

Černohorský: [5-01:21:37] It's part of Ostrava.

Burnett: [5-01:21:40] Okay, can you tell me about that research and that project? Can you tell me what you did?

Černohorský: [5-01:21:53] It's rather simple because it was just one month during the vacation period, at this factory at the so-called physical research. It was just a name. There were no physicists and no researchers, but something to investigate these various materials was done and, after the war, there was this great project UNRRA.

Burnett: [5-01:22:38] Ah, yeah. Yes United Nations [Relief and] Rehabilitation [Administration].

Černohorský: [5-01:22:43] Yes, United Nations project and this was also the case of an equipment, an ultrasonic apparatus that was sent to Vitkovice and they told me we have here this thing but we don't know what to do with it. You are studying physics, please, and so I took the equipment and I could do something which was a useful model of some properties of materials there. So it was for me it was very interesting for a day or so. They offered me to remain there to be their employee. Of course I was a student.

Burnett: [5-01:24:13] Right, right, you were in the middle of your studies. I think this is the same year as the Commission for Education Reform in Physics and Chemistry—

Černohorský: [5-01:24:35] Yes.

Burnett: [5-01:24:35] —that you participated in and so there's a larger reorientation of the Czechoslovak economy around industry and around a Soviet-style economy. And so the UN project, is it representative of a move toward cooperation with industry? So physics becomes part of an apparatus to serve industry, or not? Is physics more independent?

Černohorský: [5-01:25:30] This was I would say just at the beginning. We had some problems from a record factory where thin layers of metals were to be studied. But nothing that would be of great extent at that time.

Burnett: [5-01:26:18] I want to ask about the Institute for Metals Research. When does that begin? Can you tell me when the Institute begins?

Černohorský: [5-01:26:42] In nineteen fifty-three, in Brno, some laboratories belonging to the new Academy of Sciences were founded, and one of them was the Laboratory for the Study of Metals. I was asked to go there, and after negotiation between the head of this laboratory, the academic Píšek, and the dean of our faculty, there was the possibility that I could go there with the condition that I that I would continue with my course of physics for the first year. And so I was the fourth employee of this —

Burnett: [5-01:28:12] You were the fourth employee?

Černohorský: [5-01:28:17] There were three, and I came in and the idea was that this was a laboratory belonging to the technical section of the Academy [Czechoslovak Academy of Sciences] and it should be so that a laboratory with some fifteen people would do this work in applied physics, applied chemistry, not only not just industry but also for applied research. But, technically, with engineers, not with people from universities. However, I tried to have students, and it was I who introduced into the

Academy the system of students as auxiliary staff, perhaps one afternoon in a week in the laboratory to have some practice. This system was then expanded in the Academy quite generally. These ladies who had the leadership of the Academy in their hands asked how the system evolved and so I feel it was a success. So, not only physics and chemistry as aids for the engineers but also oriented to basic research, and this was successful. We were successful also in that way with a similar laboratory in Prague, and one wanted to decide where should be the great materials institute of the academy, whether in Prague or in Brno. In Brno was the result.

Burnett: [5-01:32:07] When was that? What year was that?

Černohorský: [5-01:32:10] This was the '50s, and so the name of the institute was very Institutes of Metals and now it is the Institute of Physics of Materials.

Burnett: [5-01:32:36] Materials science, yes. Can you describe the Academy of Sciences, when that is created? And what's the relationship between the Czech Academy of Sciences and the universities?

Černohorský: [5-01:33:06] If I understand, your question is quite general. That's very different in various areas. The collaboration between for instance Palacký University in Olomouc with the Academy is a very good example. There is an institute or a laboratory that belongs neither only to Academy nor only to the university [owned in] common, And the kind of collaboration varies. It depends very much on personal contacts between people. So, generally, there is some concurrence one could say because Academy of Sciences has its own chapter in the state finances [budget]. That means it's on the level of a ministry.

Burnett: [5-01:35:23] Okay, so it has its own budget.

Černohorský: [5-01:35:25] That's very important for the position of the Academy. Therefore [those]who are not in favor of the Academy, they would like that the Academy had not these self-financial—

Burnett: [5-01:35:52] To be independent financially.

Černohorský: [5-01:35:55] Yes, but generally the situation is not bad; it is reasonable.

Burnett: [5-01:36:04] And what is the function? What is the purpose of the Academy in this time?

Černohorský: [5-01:36:16] Basic research, but oriented also to applications, and we, in the Institute, our policy was to have two drawers in the table: basic and applied. And if there is a time where this is preferred [we use the appropriate drawer].

Burnett: [5-01:36:55] Right, so when it was required. So the Academy of Sciences is a national organization of Czechoslovakia.

Černohorský: [5-01:37:08] Yes.

Burnett: [5-01:37:08] At this time, and its purpose is to influence and coordinate according to national priorities the direction of scientific research in individual universities.

Černohorský: [5-01:37:27] You explained it much better in comparison with what I would be able.

Burnett: [5-01:37:37] But it's for this reason that the Institute of Metals or the Laboratory of Metals is created there. The Czechoslovak national government identified this problem or this need to have basic and applied research in metals to help science, and to help industry in Czechoslovakia.

Černohorský: [5-01:38:15] Certainly. Yes, there are of course also research institutes in various ministries. Yes, that means that not only the Academy and universities but also the individual ministries, some research institutes.

Burnett: [5-01:38:51] So the Ministry of Labor or even the Ministry of Education.

Černohorský: [5-01:38:58] Even the Ministry of Education, yes, the Center for the Study of Higher Education institutions.

Burnett: [5-01:39:13] Okay. Did you have contact with this ministry?

Černohorský: [5-01:39:19] Yes.

Burnett: [5-01:39:20] Yes, because you were, even in 1948, a young student, still you had a seat at the table of education reform.

Černohorský: [5-01:39:40] No, this is the history, but in the following decades there were many activities, first of all, as for me, in the Union of Czechoslovak Mathematicians and Physicists.

Burnett: [5-01:40:10] That's later, yes, but just to remain, you were talking about the difficulties of the political context from 1948 until the mid-1950s. I wanted to ask about Hungary in 1956, the invasion by the Soviet Union of Hungary to repress a political movement for greater reform and liberation. Can you talk about the effect of the invasion of Hungary on your situation in Czechoslovakia, the climate in Czechoslovakia.

Černohorský: [5-01:41:11] Yes. It was a danger one could say that something similar could happen in Czechoslovakia. Therefore, Hungary was 1956, and in 1958 there was great action within the Party to see each member what he is like, whether he is good enough to belong to the Party and to have some influence there or if there is some danger that he will do something like the people in Hungary.

Burnett: [5-01:42:17] So there was investigation of Party members to determine their loyalty to the established system.

Černohorský: [5-01:42:30] Yes.

Burnett: [5-01:42:30] In 1958, two years after—?

Černohorský: [5-01:42:33] Stability of systems seemed not to be quite sure.

Burnett: [5-01:42:43] This is two years after Hungary.

Černohorský: [5-01:42:47] This action, this great action in the Party.

Burnett: [5-01:42:54] In the Party, in Czechoslovakia.

Černohorský: [5-01:42:56] In Czechoslovakia. Just a remark, it was the matter not only of the Party members but of all employees, yes? And in my case, the chief of the laboratory was not present when they did [the action]. And he wrote, as for me, that I should not be in a leading position. That means, if somebody would say I could be director of the laboratory, “Please, Černohorský not.” And the formulation was not suitable for a leading position, and when I worked as a consulting teacher for five years of Maria [Fojtíková] and her colleagues, yes? All five years and ending thus, the physicists proposed that I should be a consulting teacher for another group. It was not approved. This was in 1978, that means 20 years after this evaluation in 1958 that I could not be a teacher anymore. It was a better example of what [this reform meant], and because I had in my documents I should not be in a leading position, and to be a consulting teacher *is* a leading position!

Burnett: [5-01:46:08] Oh my goodness. So there were very serious consequences.

Černohorský: [5-01:46:14] But, this is just like a joke.

Burnett: [5-01:46:17] Well, yeah, but there were consequences, and you had a reputation. Or, your director evaluated you based on, on what? There is a system, a state system of evaluation. Everybody is evaluated based on their loyalty to the Party or based on their sympathy with the goals and objectives of the party, and we talked earlier about your teaching, and you taught your students to be independent, that science is to think clearly and critically about the object of evaluation and your students applied this to another class on Marxism and they were critical of Marxism. They were critical of this system.

Černohorský: [5-01:47:33] Of any [system]!

Burnett: [5-01:47:35] Right! Because, to you, that’s the role of the student, to be thinking critically about anything. And there was this teacher in this other class was not happy with this criticism, with this independence. When I was reading about this period, the historian argued that the technique of communist rule was to eliminate independent positions of authority, so independent clubs, independent associations, to remove or end these sources of authority, church, anything where there’s something outside of the Party is to be eliminated and this was the period in which you were teaching, in which you were establishing your career. Your spirit, from your background, was that these systems are not—you were never completely inside a system. You were between systems. You were a Czechoslovak student in Germany. You were not a Nazi; you were not a communist. You were always in between these systems. And for you, it was very foreign and alien to think, “I’m completely inside a system.” So it was a struggle for you and there were consequences for you in your career. So this is the period of the early to mid-1950s. Why

don't we take a break and we will return in another session to talk about the period of the 1950s to the 1960s in the afternoon.

Černohorský: [5-01:49:54] Okay. Thank you very much.

Burnett: [6-00:00:00] This is Paul Burnett interviewing Dr. Martin Černohorský for the Černohorský oral history project and it's still November 3rd 2018 and this is session number six and we are still in the 1950s. We're in Brno at this time, and I wanted to ask about the location of Brno during the Cold War. It is so close to Austria, and so close to Vienna. In an earlier session you said that Brno was almost a suburb of Vienna, but at this time the border is closed. So I wanted to ask you how things were different in Brno during this time of the Iron Curtain between the West and the East was there more risk or suspicion because Brno was so close to the border? What happened to the close connection between Vienna and Brno? Of course, it's cut, but I wanted to ask you where their consequences for Brno being so close to the West geographically in this time in the 1950s?

Černohorský: [6-00:02:21] The border was, of course, not open. It was cut, and the cutting was very severe. That means, if you mentioned the connection Brno-Vienna then it was the TV, but no personal contacts as it would be usual. In this respect, there was nothing special, no difference between Brno-Vienna and Prague-Vienna. The whole country was closed.

Burnett: [6-00:03:28] And you said TV was the only difference; the only connection was TV. What evidence or material or culture did you receive from the West in Czechoslovakia during this time? Did you have recordings? Did you have radio? Did you have literature? What was coming in from the West to the East and what was coming out from the East to the West?

Černohorský: [6-00:04:09] What was coming? What was *brought*, yes?

Burnett: [6-00:04:17] Yeah, okay.

Černohorský: [6-00:04:18] [chuckles] Yes, and what was brought was from people to whom we had some connection, for instance professor Jelínek, the first Rector of Masaryk University after the Velvet Revolution, he was some years ago in Paris at the Sorbonne as lecturer in Czech, and from that time he had some connections, and so he invited them. And this is an example, and these people came as tourists. Yes, of course in the luggage there was literature. And this was something which we used, many of these books for our samizdat. There were many editions in Prague. We could take it from Prague to Brno and in Brno make more copies. It was the time without high-technology help, yes? Just a normal writing machine where twelve copies was the maximum one could make with one.

Burnett: [6-00:06:46] Typewriters, you made it with a typewriter?

Černohorský: [6-00:06:49] Yes, and these copies were going into the public, not public, a very limited public.

Burnett: [6-00:07:06] Yes, a private public.

Černohorský: [6-00:07:09] Yes, so that means this was one kind of connection: literature. Some of my colleagues in Prague as physicists, when they were allowed to go

to the West with their presentations, they would return with [Carl Friedrich von] Weizsäcker and various literature of this kind. And this was one possibility. Then, we organized the subterranean university.

Burnett: [6-00:08:05] The Subterranean?

Černohorský: [6-00:08:09] The “Underground University.” In Brno we had two of them, one German and one French-speaking. This was in our house, Jelínek’s flat was on the same level in our houses.

Burnett: [6-00:08:48] So you were in the same building?

Černohorský: [6-00:08:54] And these people from abroad came and so we had sometimes eighteen people attending this lecture. And so various topics were discussed, for instance, the new universities founded immediately after the Velvet Revolution. It would not be possible to do it so quickly without this preparation long before. So that means these connections were not so extensive, but very effective.

Burnett: [6-00:09:57] Was it illegal to bring some books inside Czechoslovakia?

Černohorský: [6-00:10:09] It was illegal and was not. It depended. Of course, if it was depending on what was done with the luggage of these “tourists” and in this case, it was clear: that it is not tourist material, but *libri prohibiti*.

Burnett: [6-00:10:52] So there were titles, there were certain books that were not permitted.

Černohorský: [6-00:11:01] Then it was taken from those people and maybe [they were] not allowed to come to our country again.

Burnett: [6-00:11:21] Right, they would be banned from coming back.

Černohorský: [6-00:11:26] Yes. It was rather extensive in Prague; in Brno, not so extensive; very rare in Ostrava. This was two or three people who were [active?]. When I had this among my colleagues at the faculty, but I had to be careful that I didn’t offer it to anybody, just to people where you could trust them. There are some of them who were very careful, and if you offered it to them, they maybe didn’t accept it.

Burnett: [6-00:12:51] If you were a member of the Communist party and so did you ever— Were any of the people in this group members of the Communist Party?

Černohorský: [6-00:13:11] Yes.

Burnett: [6-00:13:13] Yeah? Okay. So it was risky for them.

Černohorský: [6-00:13:17] Yes, of course. For instance, Jelínek —

Burnett: [6-00:13:23] Oh, Jelínek was a member a Communist Party!

Černohorský: [6-00:13:27] And fired in the Normalization after the occupation [August, 1968]. He was fired with the Soviet—

Burnett: [6-00:13:37] So they discovered that he was not a good communist after the Prague Spring. They the authorities discovered that Milan Jelínek was not a good communist.

Černohorský: [6-00:13:56] As for him, of course, the secret police contacted him and was interested to get him for cooperation. Because they knew that people, for instance

Burnett: [6-00:14:29] To finish that thought: they knew that *he* knew people in this “private-public sphere” or circle, the Underground University. They, the authorities, they were looking for the Underground University?

Černohorský: [6-00:14:54] They knew nothing about it. Just some very trusted— Whom you trusted, you could inform them, but otherwise not. Of course, we went, for instance, March the seventh, Tomas Garrigue Masaryk to Lány, where he has his grave, and there we sang our anthem.

Burnett: [6-00:15:53] You sang the national, the Czech anthem?

Černohorský: [6-00:15:55] Just such a group of people, but you must know that for instance in this case we were not informed that among us is a man who was collaborating with the secret police and informed them about the event.

Burnett: [6-00:16:35] There was a spy in the group.

Černohorský: [6-00:16:39] Yes.

Burnett: [6-00:16:39] And so just to be clear, let me ask this. Why were you celebrating?

Černohorský: [6-00:16:50] Just to give honor to him and to the situation. When he was president, that means the democratic republic, democratic system.

Burnett: [6-00:17:22] I read that the Communist Party in those days was very successful in reclaiming the Czech past, so Jan Hus, all the big symbols of the Czech past. The Communists—even Masaryk, even Masaryk—they said this is part of the great communist heritage.

Černohorský: [6-00:17:54] Of course, this was to be interested, first of all, Soviet Union, and this policy of those times.

Burnett: [6-00:18:12] Can I ask, if someone like Jelínek, who was fired, right? What happened if you were fired from your position? What did Jelínek do after? What could you do after?

Černohorský: [6-00:18:36] He was fired from the university, and he was allowed to be a scientific research in the Institute of the Academy [of Physics]. This was his position.

Burnett: [6-00:19:00] So the punishment was not to teach students.

Černohorský: [6-00:19:06] They didn't want them to have influence immediately, direct influence at the university, no power at the university.

Burnett: [6-00:19:24] So there were consequences. It was risky. It was dangerous.

Černohorský: [6-00:19:30] Occupation, after the Soviet occupation.

Burnett: [6-00:19:34] Right, but just during the 1950s and the early 1960s. there was a small community?

Černohorský: [6-00:19:48] No, '68 was the Soviet occupation.

Burnett: [6-00:20:06] Yes, but before the Soviet occupation, there were groups of people who were communicating with intellectuals outside Czechoslovakia. They were bringing materials that were not acceptable to the Communist Party, Karl Popper, for example. So Karl Popper, was he a was he considered to be a bad influence? Did the Communists not like Karl Popper?

Černohorský: [6-00:20:54] From that time, no, but for instance even Einstein could hardly be unedited truly as a whole. His book of essays, for instance, *Out of My Later Years*, this we had in our editorial board for editing like samizdat and the whole book was translated and prepared for publication as samizdat, but we were not quick enough and the Velvet Revolution came. But before, there were some publishing houses that were active in Brno, including ours. We began in 1985, and the first item was by [Erwin] Schrödinger, *Mind and Matter*. This is the second part of the book *What is Life?*, and this *Mind and Matter* was the first issue translated by Maria [Fojtíková] and then I read the first chapter of this *Mind and Matter* in my normal lecture in physics before discussing the physics contents [of the course].

Burnett: [6-00:23:42] When was the first time?

Černohorský: [6-00:23:44] This was the early 80s, and after this, when one student came to me and said, "We saw that you have read it that means you have it in writing. Please, could you give us the text? We would like to discuss it in more detail in the dormitories." Yes, and I gave him the first chapter, what I had read. They came again, "We guess you have the whole book!" And so I gave it to them, and one of them was serving in the army and was allowed to go home for the holidays for two or three days and he wrote me "I would be in Brno from the hills outside. But now I would like to visit you at the Faculty." I wrote to him, "Please this is so little time." I said, "You will be in Brno. Don't come to the Faculty. You have your family." He said, "Oh, no, I would like to come," and they came and gave me a bound copy of this book. Because, in the army, he was engaged as somebody who was able to work with these, in those times, new technologies. And so he wrote, and gave me a very fine bound book of essays.

Burnett: [6-00:26:37] He came and gave you a copy, a second copy.

Černohorský: [6-00:26:40] This is a just an example. Yes, so, what I do with my students, yes. Of course, I was careful. I asked Marie [Fojtikova], do you know what samizdat is, and so one of could go to those students.

Burnett: [6-00:27:21] Why did you use the first chapter of *Mind and Matter*? It's Schrödinger.

Černohorský: [6-00:27:32] Yes.

Burnett: [6-00:27:33] Why, what is good about that first chapter? Why did you choose it?

Černohorský: [6-00:27:40] Because it was clear that this belongs to the literature not published in our country. Yes, and the sense of our samizdat was not to publish the production of our writers, our Czech writers, many of such samizdat activities but we concentrated all to translations of the philosophical literature, which had no hope of being edited by our official publishing house.

Burnett: [6-00:28:51] Yes, but why did you teach with *Mind and Matter*? What was the content of that first chapter that you liked? Why did you like it?

Černohorský: [6-00:29:11] Because the introductory chapter is of new physics content. That means that the students would know that there is literature like this.

Burnett: [6-00:29:36] Yeah, so it's something that's not published in Czechoslovakia, and it's out there and to expose them to it.

Černohorský: [6-00:29:46] And when we were together with our colleagues in the Union of Czechoslovak Mathematicians and Physicists, I had in my luggage many samizdat publications, and we disseminated the culture.

Burnett: [6-00:30:27] That's important. So that is part of your job as a teacher, as a scientist, is to disseminate culture. I want to return briefly to the 1950s and ask you about students. You had these graduate students. You said in an earlier session starting in 1952 that you had great students. Can you talk about the accomplishments of some of your students?

Černohorský: [6-00:31:23] Sorry, this was in 1954, because this was the time when the realization of the reform came to be. That means, a group of students who were prepared, not as teachers in secondary schools, but also for research, for not only academic, but also other institutions. Research institutions of that kind. And the first group of these students was extremely interesting and successful. There were several of them, the names are perhaps not so important, but some of them are very well known as Jiří Grygar, and then for instance at the Technical University of Brno, there were two mathematicians and two physicists as professors or assistant professors. Two of this group were people who co-founded the Learned Society of the Czech Republic. This was extremely successful, and I used these dispositions. That was the case when I said, "Please, we can have this scientific circle. Whoever is interested can attend," and they all attended.

Burnett: [6-00:35:03] The students were very enthusiastic?

Černohorský: [6-00:35:07] They were enthusiastic, and then I established the program which was very useful for them. The program was manifold, constructed so that they had presentations on the basis of a book about measurement, physical measurement. Yes. This

is something they could feel is very useful for them. Yes, and there were 12 and I proposed some 20 topics for individual research right and one of it was how was it with Newton's gravitational law?

Burnett: [6-00:36:19] Yeah. We did talk about this in an earlier session.

Černohorský: [6-00:36:23] Yes? I mentioned it?

Burnett: [6-00:36:27] Yes you did.

Černohorský: [6-00:36:28] And this was the case, I explained already, the Latin version not may be possible, but I explained why. And that means inspiration for languages quite general and inspiration for *primary* literature, not secondary. Yes?

Burnett: [6-00:37:05] Yes, you are like a historian. The emphasis on the primary source is—

Černohorský: [6-00:37:12] It's clear. Of course, not all groups of students. A similarly very good group was the group with Maria [Fojtíková] and others.

Burnett: [6-00:37:34] That was later, that was in the 1970s.

Černohorský: [6-00:37:36] This is already in the 70s. I mean, to have influence on students, that's the point. Yes?

Burnett: [6-00:38:00] Yes, and during the late 1950s, you took advantage of your participation in conferences to do something here involving your students: the UNESCO project and the project that led to the Mössbauer Effect advice or position paper. I looked at the UNESCO physics teaching project. It's very big. It's 300 pages or more and it has many contributors from around the world. I'm wondering can you talk about how you organized this work and how did you involve your students?

Černohorský: [6-00:39:11] There were several kinds of activities. One of them was to engage. physicists who were not at schools, but as researchers, and it was no connection between this physicists and the physicists who were at universities. So, I organized with the help of Marie [Fojtíková] and others, but we were a very small group, only three or sometimes four, and prepared these great seminars. I do not remember whether we spoke about these dialogues.

Burnett: [6-00:40:39] No, we haven't yet.

Černohorský: [6-00:40:42] Maybe a few words. Well, it was something quite unusual in so far that it was announced more than one year before the event. Yeah, but for the event I had also already engaged the main speakers. But, it was not a seminar of two hours; it was a seminar with four days full of various topics. So the formation of the program the announcement of the speakers was the first step. The invited people who were interested reacted, and one year before, sent materials, their papers.

Burnett: [6-00:42:16] For the reaction?

Černohorský: [6-00:42:19] And their papers were not published one year after the seminar but immediately. Yes, and therefore it was first the announcement and then preliminary notices and materials.

Burnett: [6-00:42:49] A call for papers, yes.

Černohorský: [6-00:42:51] This was reacted, and so before the seminar, six times, those who were interested submitted material and after such a preparation came the main event. Yes these were very qualified presentations. And of course, it was very interesting for people who before were not engaged in physics teaching. And what I would like to stress is that this four-day seminar was organized not only as a professional physics event, but also as a cultural event, which means accompanying in the place was the well-known composer Bohuslav Martinů, to see in connection with him, so that it was not only a physics event but also a cultural event in which the main topic was physics.

Burnett: [6-00:45:08] Yes. So you had if I remember, because you showed me the *Dialogues*. It was a volume, and you had performers. They performed a string quartet. So music was part of this, and so if I understand right, the announcement of the seminar was one year in advance.

Černohorský: [6-00:45:36] Yes.

Burnett: [6-00:45:38] And there was a request for papers immediately. Submit papers about this and then five more, in sequence, calls for the — now, does the second one respond to the first one; the third one a response to the second *and* the first?

Černohorský: [6-00:46:00] A continuous action.

Burnett: [6-00:46:02] A continuous conversation, a dialogue.

Černohorský: [6-00:46:07] Yes.

Burnett: [6-00:46:08] Yeah, but about subject matter. Was there a fixed subject matter in physics? Was it a set of questions about physics problems to be determined? Was it open or very specific in the questions for the seminar, the topics?

Černohorský: [6-00:46:30] The other action [objective] was to found a group within the scientific section, physics section of the Union of Mathematicians and Physicists. and within the scientific section was something which I named Pedagogical Physics, to have the teaching of physics as a scientific discipline, a topic in science. What's important [was to have it] within the scientific section of the Union not within the pedagogical section, to attract people who are not teachers by profession and this group organized seminars very often with current ["actual"] topics. The past ten years, I organized the action named Academic Forum, in Prague so that it would be easily accessible to the people from the ministries, from the central [government]. And this was done for 10 years regularly each month. except July and August, meaning 10 academic forums in a year and it was not fully 10 years, but nearly. This was a forum for discussion of "actuals," which means if some legislation was going on, then we discussed it. It was a very effective way, not because of the number of participants — they were sometimes maybe only 12—but the materials were sent to 900 addresses.

Burnett: [6-00:50:27] So it was almost like a newsletter.

Černohorský: [6-00:50:29] And I was often asked, “When will be the next forum?” They didn’t participate in the seminar itself, but they are accustomed to getting this material every month.

Burnett: [6-00:50:51] So it was like a newsletter. It gave you updates on the progress of the forums. It was like news. You would find out the contents of the Forum.

Černohorský: [6-00:51:04] And therefore I became so known even among people not in Brno because of this activity.

Burnett: [6-00:51:24] So I want to situate all these activities in time. So, the Dialogues, when did you have the dialogues seminar? What year was that?

Černohorský: [6-00:51:41] There were are three such great actions. The largest one was in 1986; 1979 was the first, and 1984 the second. The first was about quantum mechanics and was rather special; the other one was multithemed.

Burnett: [6-00:52:38] And the foundation of the [Section of] Pedagogical Physics in the scientific section of the Union of Czechoslovak —

Černohorský: [6-00:52:48] The foundation of Pedagogical Physics, the first conference, the founding conference was in Brno, 1979.

Burnett: [6-00:53:04] And the academic forums in Prague?

Černohorský: [6-00:53:07] The academic forums in 2008, and it was a reaction of what one wanted to do with the evaluation of the results of research, and this was so stupid that we said nothing like that and we held a seminar with great success using this criticism and so I said to myself that we must do something, some forum that would be at the disposal, not only for one month, but ongoing, yes? It is so very useful also that one sees what it means to have power, because with many proposals we were not successful. For the Ministry [of Education], it is simpler to do it, so it was done by the previous Minister, and so there are many actions not so not much effective, but it goes on. And we are waiting for a minister who would make in these matters a rather great reform.

Burnett: [6-00:55:50] Right. Well, is there a pattern to these activities? I think there is, but I will ask you, in general, what was the problem that required these innovations, the dialogues, the scientific section of pedagogical physics? It’s a problem, it seems, of communication.

Černohorský: [6-00:56:28] One of the problems is finances, how to finance the education process and so for instance, the ministry came up with the idea that the criterion could be the number of students at the institution and that’s nonsense. One can see the consequences when I was in opposed to it. I said, “Please, well, you can do it but that means that the universities will be eager to have as many students as possible whether the student is a good student or even able to graduate,” yes? And at some discussions. I heard, “Well then, not the number of students who apply and are admitted but the number of graduates.” My reaction was “well, then all who are the universities

will graduate.” “Well, then only students who are graduated with very good results.” It’s not the same.

Burnett: [6-00:59:10] Yeah, all will have good results.

Černohorský: [6-00:59:16] Now, but a concrete case: somebody who has no intention to study but to have one year the status of a student. It brings some advantages. He asked at the faculty office, “Please, is it sure that you will fire me at the *end* of the year and not sooner?” Nobody saw this man at the school but he was for a year a student.

Burnett: [6-01:00:20] He had the—

Černohorský: [6-01:00:22] —loans. That’s an example of formal legislation, how to prepare laws. At the ministry, they prepared it and so on. I think there is plenty, but the Ministry has the power to do something with this reaction. No admissions, yes? But of course, I am sure you understand this that my opinion is my personal view. Yes. It’s no guarantee that only I am right.

Burnett: [6-01:02:00] The truth.

Černohorský: [6-01:02:01] It’s my opinion.

Burnett: [6-01:02:04] I understand, but I think it’s important to understand your perspective and one question that we ask in all countries dealing with education. The value of education and the structure of education, what model should we have? What basis should we have for educating the public? So for example is the university a business? Is the university a business?

Černohorský: [6-01:02:58] Ah, a kind of business. Yes.

Burnett: [6-01:03:10] So, for example, the people who advocated that we increase the numbers, the quantity of students so that we increase the revenue or we allocate resources based on the number of students: it’s a kind of economic rationale. And you are saying that’s the wrong metric, that’s the wrong way to understand education. Tell me about your view of the purpose of education.

Černohorský: [6-01:03:53] They are public universities and there is a sector of private universities. I’m asking, what is the reason that somebody takes the idea to found a private university. What’s the reason?

Burnett: [6-01:04:26] One reason is to make money. Right.

Černohorský: [6-01:04:30] Yes, and I am afraid it may be the main reason.

Burnett: [6-01:04:43] Yes, it’s probably the truth.

Černohorský: [6-01:04:46] Therefore private universities, please do show me a private university with programs of physics, of chemistry, of biology, programs where something is needed to invest, nothing like economics, law, yes?

Burnett: [6-01:05:24] So in the Czech Republic.

Černohorský: [6-01:05:26] Yes.

Burnett: [6-01:05:28] Well, they're in the university model, there are private universities that do: Stanford, etc.

Černohorský: [6-01:05:35] I mean our system.

Burnett: [6-01:05:38] So in the Czech Republic, the private universities are professional schools: law, business, dentistry.

Černohorský: [6-01:05:53] What's easy to organize you need just a house and teachers, right? No laboratories. In Czechoslovakia. Now in Czechia, private schools, private universities, private high schools with laboratories? No such thing.

Burnett: [6-01:06:30] So public education is not just training of students; it's to increase knowledge, to serve the larger, to serve the country, to serve the nation, to produce students, to produce knowledge, to produce applications of the knowledge. And that's expensive, so it's difficult to allocate public resources to universities. And one argument that you saw was someone said, "Well, the universities with many students should get much money according to the number of students." And you said no, that's wrong. So what are the correct criteria for determining the allocation of finances to universities?

Černohorský: [6-01:07:49] That's difficult because not all the universities are able to do what I mean. When I was teaching at the pharmaceutical faculty, that was the first semester. There was a slogan—not quite general—but just as an example: "Where there is Černohorský, you will complete your studies," meaning successfully.

Burnett: [6-01:08:48] So, if you study with Černohorský, you will succeed, you will be complete.

Černohorský: [6-01:08:59] It so difficult, and it's true that some people say after graduation, the first year was the most difficult. And what I appreciate very much is that they were given the most, even in this consultation teaching in this special form of education that I used. I think that if we proceed in such a way that we do not accept people without dispositions for graduating, at some good level, then it's the task of the first-year [teacher] to proceed in such a way that whoever has success in the first year, we can be sure that he is able to graduate with good success. And this is of course the task of the teachers in the first year.

Burnett: [6-01:11:16] Yeah, so the goal is public education, but successful public education. In other words, everyone should have an opportunity to study, to learn, but it is the job of the university to decide who is likely to complete the studies because it's an investment. It's expensive in this respect.

Černohorský: [6-01:11:55] We are not successful with what we do with those who go to the university. An example from this exceptionally good group [of students in 1954]. There was one man, and I saw after a few weeks that his disposition [aptitude] for physics is not good.

Burnett: [6-01:12:41] Oh, did you tell me? Is he the guy who became an architect?

Černohorský: [6-01:12:45] Yes. This is the case.

Burnett: [6-01:12:46] Okay. Yes. Yeah we talked about that.

Černohorský: [6-01:12:48] And what I mean, is that we should make this investment, that we speak with people and we correct their initially not good choice of program of study.

Burnett: [6-01:13:17] So you your responsibility is to listen to their plans.

Černohorský: [6-01:13:27] And this should be done in the admissions process. I have done for instance this: I took the list of applications for studying physics and I sent them already in April the content of the admission examination, the written examination. I took something two years old and asked the candidates to simulate the situation of the examination. That means you have one hour quiet undisturbed, and send me what you have done in this. So, I will give you information on your chances. My colleagues said that this is nonsense because they will send something that was done by somebody else.

Burnett: [6-01:15:28] Oh, it would be fraud.

Černohorský: [6-01:15:30] Or they sent something after, not one hour work, but after two hours work. Nothing like that, because I explained in the letter, “If you are interested then you must simulate the situation, otherwise...” So I sent them the results on a list of all applications, without names, only a number. The most successful first, and so on, and the line for the addressee underlined. And he knows, there is the number 20. I informed them it was in my hands to organize it such that 16 will be accepted, four places will remain free for those not admitted, but who will arrive and say there is a mistake. Yes?

Burnett: [6-01:17:20] It’s a waiting list.

Černohorský: [6-01:17:23] Yes, that means there must be space for these cases. And you see there are 60 applicants and you are in fifth place. Yes? It’s very probable. Or you are 38, please, it’s better to retire the application to physics and to apply—

Burnett: [6-01:18:09] Somewhere else—

Černohorský: [6-01:18:10] —somewhere else where it is not so difficult as a technical university. This was successful.

Burnett: [6-01:18:24] So you proposed this and it was made into a system?

Černohorský: [6-01:18:30] That was one example, and what I mean is that if we give the energy and the work in this preparatory period, then we have a more effective system.

Burnett: [6-01:18:55] Although, it is difficult to predict academic success based on tests alone. In the United States, the testing system is good at predicting the first year. The score correlates with performance in the first year, but not the full four years. So that’s the problem in the US. It’s a specific issue. Yeah, but the grades in the last years of high

school are a better predictor of academic success. At any rate you were saying there was *no* system. There was no system to evaluate before.

Černohorský: [6-01:19:48] The problem is that this [university] means work, and when people are interested in avoiding work, they say it's not necessary.

Burnett: [6-01:20:11] There is a maybe a cultural problem in recent years, at least in the United States and Canada and other countries, where we have a generation that is told if you want something you can have it. And you have situations where someone is not good at physics, and they fail, let's say they get a low grade and they say to the professor, "but I worked really hard!" And the answer is that it doesn't matter. You were not successful. And I think there are many people today who have difficulty understanding that, because they are told if they work hard and they want a result, they will have it. I think we need to do a better job of saying some things you can't have even if you try. It's better to match your talent with your objectives so that you are happier. If you can meet the requirements, of a course, of a job, of whatever.

Černohorský: [6-01:21:49] I had many years ago already the idea that the system should be changed very dramatically in the way that the examination would not be done by the teacher who is lecturing, because for the students, he is the teacher who will examine us. He's an enemy. And as students, they must try to fight against this enemy to be successful. This influences these student-teacher relations. In the moment when the students know that this is my teacher, but the examination I must do in another institution, or here, but examiners will come from outside. Then we, that means, the students and the teacher are together, and we both have a common enemy. Yes?

Burnett: [6-01:23:51] This system exists. It's International Baccalaureate. I took that system and it's true. This is true, because our exams were sent to Geneva.

Černohorský: [6-01:24:07] In the moment, something similar is in the systems where only written, not oral examination, exists. Then the student-teacher relations must be. Because this is of course the main thing that is going on. I explained this to the students on the basis of the three worlds of Karl Raimund Popper. Your second world and my second world, if we do not know it, no hope for understanding each other.

Burnett: [6-01:25:14] Right. So you want education evaluation to be objective. So I see two aspects of your teaching, of your pedagogy, your philosophy of teaching. One aspect is *in loco parentis*, the Latin phrase for education in universities in the West, that students come to university but they are eighteen, nineteen. In some ways, they are still children. So *in loco parentis* means that the university is like a parent, to help them become adults, professionals, successful in life. So they are protective to some degree like parents. At the same time, like a parent, if you love your child, you will not help your child if you protect them completely from everything, including a poor grade. So the best is to prepare them for the outside, for a third reality that is indifferent to them as people. So your job as a teacher, as I interpret it, is to protect them from that third universe of evaluation.

If you could, you would give everyone a good grade because you like them. A teacher wants every child to be, wants every student to be successful, but the world evaluates differently. Some are successful; others are not so. In your teaching, you want to prepare

the students to be resilient, to be able to face the challenges of life. Is that an accurate description of your role, your philosophy as a teacher?

Černohorský: [6-01:28:08] Yes, much better than I would be able to explain.

Burnett: [6-01:28:16] Oh, I think you are explaining the different aspects of your approach, and it seems like you want to reduce the barriers between different types of scientific activity and to make people reflect on good teaching, even outside of the academic domain. So by the foundation of pedagogical physics in the scientific section of the Union of Czech and Slovak Physicists and Mathematicians, you wanted non-academic or even scientists who were researchers to reflect on education, to think about it and the academic forums in Prague. It's not just academics in the academic forums, right? Who could be in the in the academic forums? You said 900 people received the news about the academic forms. Who were these people? Were they all professors? They were professionals, right? You said it was for the people from the ministries. So these are bureaucrats, professionals, you wanted them to think about academic questions and problems and they could be of different, a wide range. So I interpret your approach, when you think of education, it's never just the class. It's never just the university. It's the research laboratory. It's the Ministry of Education. It's the ministry of Labor. It's private companies. Education happens everywhere, all the time. Is that correct?

Černohorský: [6-01:30:51] Yes.

Burnett: [6-01:30:53] One last question I have for you, just for this session, is interdisciplinary teaching. This is work that you started in the 1960s, you had forums on interdisciplinary teaching. Why was there an interest in interdisciplinary teaching? Why is it good? Why is it a good thing to have interdisciplinary teaching?

Černohorský: [6-01:31:33] Well, that's one of some quite general questions. I personally was not in the situation where I would decide "and now, the topic interdisciplinary question." It's quite naturally to do something reasonable for education, in this case for physics education, and as I have my own experience with something called autodidact. Yes? Okay.

Burnett: [6-01:32:45] Yeah self-taught, you were self-taught.

Černohorský: [6-01:32:49] Then I saw how fruitful it could be to go in some subjects where one is perhaps not just at home, but what is or could be useful, and therefore, when I had the opportunity to discuss various methods, subjects, various topics with people from UNESCO and Moscow International Congress of Crystallography, I mentioned the possibility to do something where universities without experts in some subjects could also have the opportunity to give the students some knowledge in it. It is not necessary that. This would mean to hire for the chosen subject a teacher, but to give to the existing staff material that is very simple, not difficult, to understand. Therefore this was accepted by UNESCO. Our government gave it as the proposal from Czechoslovakia. It was successful. They were surprised how little money I proposed. There is nothing if one does not see money as the main thing.

Burnett: [6-01:36:13] You said you proposed little for it? Oh, the *amount* of money you requested was small.

Černohorský: [6-01:36:30] This we realized with these two projects. This was in '66, and it was then just to use it in another way when UNESCO organized in '68 a specialized conference on this interdisciplinary university teaching that I was invited, even though I was no expert in this. And so I was of course very glad to come together with Holton and other great experts.

Burnett: [6-01:37:38] Metallurgists, in crystallography, yes.

Černohorský: [6-01:37:42] So that has been quite comprehensible that such actions have success. I need not add anything to what I say at the beginning that to have knowledge in another branch is an advantage in any case.

Burnett: [6-01:38:26] It's very true that you find that disciplines are a common body of knowledge that is devoted to a set of problems with a set of techniques with a set of technologies that change over time and that's good. But we learn when we pass into another discipline, another dimension. We learn new things and it makes us flexible, mentally. I think aback to your education in languages. You learned to operate in different languages in different environments, to speak Czech, to speak German, a little bit of French and Latin, and you spoke of Latin as "mathematics in words," and so you benefit from learning in new environments and, the self-teaching going into something and you were not afraid to learn something new, completely new, and you taught yourself how to use the X-ray machine.

Černohorský: [6-01:40:00] Yes, one should be prepared for such topics where not only one scientific branch is in action. Yes, this case with 300 years of incorrect translation of Newton's so-well-known law. The solution of a rather fully clear explanation, this is then a mathematical, physical, historical, linguistic study. Without these four areas of sciences has it would be hardly possible to have such a clear explanation of this case. And it should be nothing special that we use various sciences in the solution of problems. That's life!

Burnett: [6-01:41:59] Right, life is complex and demands—

Černohorský: [6-01:42:04] In any case, it's an example of the fact that what the student learns from his university studies is advantageous.

Burnett: [6-01:42:25] Well, perhaps we should break for now and we will start again tomorrow.

Černohorský: [6-01:42:34] Thank you very much.

Burnett: [7-00:00:00] This is Paul Burnett interviewing Martin Černohorský for the Černohorský oral history project, and this is session number 7 and it is November 4th, 2018 and we are here in the offices of the Rector of Masaryk University. Welcome, Dr. Černohorský, again.

Černohorský: [7-00:00:43] Thank you.

Burnett: [7-00:00:44] It's a beautiful Sunday morning, and I wanted to talk with you about being a scientist, researcher and teacher in a politically challenging time for intelligent people such as yourself, so I wanted to turn to an important period in the history of Czechoslovakia and the Czech Republic, to the 1960s. Around the world, the 1960s was a time of change for many countries and Czechoslovakia was no exception.

So I would like to ask you about your memories of the period of reform at the end of the 1960s. Can you tell me what that period was like, the transition from Novotný to [Alexander] Dubček? I'm not sure if I have the pronunciation correct? Is it [Antonín Josef] Novotný, the president?

Černohorský: [7-00:02:15] Yes.

Fojtíková: [7-00:02:16] Antonín Novotný.

Burnett: [7-00:02:18] Novotný. So he was a leader in the 1960s, but he was replaced by Dubček and I'm wondering if you can tell me if you remember at that time, what was changing in Czech society? And what were you doing in in that time period where you were working on the UNESCO project you were very busy in the 1960s, but can you tell me what you remember of the period of reform?

Černohorský: [7-00:03:03] This period was on the one side very complicated; on the other side, It might seem a simpler one. It depends on the view of the individual. Me personally, I had this great change because from '56, I was no longer at the faculty [Faculty of Sciences of what is today called Masaryk University], but in the Academy [Institute of Metals at the Czechoslovak Academy of Sciences]. And in the faculty, I was engaged only with some special lectures for the last semesters and the work with students before graduation.

This is quite another work compared with the students who are freshmen at the universities. And I was very intensively involved in the building up of this new institute of the academy, and we could use this time because it was the time after the hardest years of the 50s. In the 60s, it was already something better.

Burnett: [7-00:05:03] Can you describe some details, when you say "better," the criteria of "better?"

Černohorský: [7-00:05:13] For instance, it was possible – this was of course already '67 – for me to go to Florence to the founding conference of the European Physics Society. Or the next year, '68, to Paris. Even after the occupation, there was this possibility. And

the 50s as a whole, let's say, for me personally, in one sense something more quieter when I could concentrate on research.

Burnett: [7-00:06:16] The 50s or the 60s?

Černohorský: [7-00:06:22] Sixties.

Burnett: [7-00:06:23] The 60s, you concentrated on research.

Černohorský: [7-00:06:26] There was also for me a great change. Then at the Faculty, this was very extensive work with the students. Not the same at the Academy. Of course, I took my students from the Faculty to the Academy to work with them on their diploma work. And this was very interesting. I had of course good students, and I was, not perhaps proud, but very satisfied if people from abroad came and they were interested what we are doing and I showed them these three diploma projects [thesis research]. There was a good project and they were surprised that these are diploma work for "magister."

Burnett: [7-00:07:47] Master's.

Černohorský: [7-00:07:48] For the master's degree and not for doctor's degree. So the work was very successful and not only with the students. The Institute [of Metals] did good work in general. Politically in the academy we were less intact in comparison with the university.

Burnett: [7-00:08:36] Less in contact?

Černohorský: [7-00:08:39] We were more free. And we had some contacts, the visits from abroad, especially me personally. I had the opportunity to accompany people from abroad to a great extent because – they came to Prague of course – but they were interested in what's going on in Brno, what was going on elsewhere in Moravia. And so the Prague office sent them to Brno, and in Brno I was elected as the contact. That means people from China came to Brno and now I was a few days with them traveling, not only in the nearest neighborhood of Brno but also in Ostrava and elsewhere, and if you are a few days with a group of sympathetic people, so I was informed of what's done in China to have only one child in the family, and such, let's say, almost private information. Yes, and of course the same with people from Germany, from France, from England. So this is to say I am not entitled to speak about this time for the general politics. My view was not objective from the whole.

Burnett: [7-00:11:15] Well you were lucky, I suppose.

Černohorský: [7-00:11:18] Yes, and as for politics, it was not my job. It was the job of the director of the institute. We were very well – we consulted political things of course. We were prepared to have materials when one had officially from the Academy: *basic* research is the main thing. And they came some other year and said "*applied* science is important." We had prepared materials for applied [research].

Burnett: [7-00:12:24] Yesterday, you said you had a desk with two drawers: one drawer, documents "applied"; the other, "basic."

Černohorský: [7-00:12:34] Metaphorically.

Burnett: [7-00:12:36] Yes, but very politically astute. You had to be prepared to please different communities to be safe.

Černohorský: [7-00:12:51] Yes. And I mean I was in this way fully satisfied. And it was the faculty, the dean. One of my former students, he was a chemist. But in the physics laboratory he was my former student and he asked me, “why do you not habilitate? [apply to achieve the next academic rank] Please, give me materials.” And so I had these negotiations on the basis of the activities of the faculty, not for me. This is rather personal. In my life, there were no situations where I was active to be given something or to be appointed. It was always the other side who came to me, “Please, take this or this.” Yes?

Burnett: [7-00:14:49] You did not seek personal gain, personal advantage in your career.

Černohorský: [7-00:14:56] Yes, and that was quite normal that people are active to be assistant professor, to be professor, to be rector. That’s not my fate.

Burnett: [7-00:15:21] To have a career, to have a trajectory. Yes.

Černohorský: [7-00:15:27] And therefore I repeat, maybe I am not qualified to give good information on what was going on in the society as a whole, yes. I was informed of the Underground University.

Burnett: [7-00:16:00] Well, we will speak about the underground university in a moment. Let me ask you this: August 21st, 1968. Do you remember?

Černohorský: [7-00:16:15] 1968, the Occupation?

Burnett: [7-00:16:19] Yes. Can you tell me what you remember?

Černohorský: [7-00:16:25] I remember that in the night, I was called by my colleague, “Martin, we are occupied. Yes, and then it was a rather special thing. One news man from Holland characterized the situation like this: it could be for the first time when words could be successful in battle with weapons. You know, because in all the streets, [there were] inscriptions and so, “Russians go home.” “Moscow: 2,000 kilometers.” [laughter]

Burnett: [7-00:17:40] So it was a sign that said, in the direction of Moscow, 2,000 kilometers this way.

Černohorský: [7-00:17:52] Yeah one of our writers said, “[give] nothing to them, not even a drop of water.” Nothing for the occupants.

Burnett: [7-00:18:08] Right, deny them any favors or any special treatment? So, resistance. There was resistance, but not fighting, right?

Černohorský: [7-00:18:23] Not a resistance, and there were, with [Alexander] Dubček, and [Josef] Smrkovský, [Oldřich] Černík, the four most important men in the Czech government. They were a symbol for the resistance.

Burnett: [7-00:18:49] Dubček was.

Černohorský: [7-00:18:50] Four men: Dubček, Smrkovský, Černík, the Premier, yes? “And we are with you; you must be with us; and now, unfortunately I cannot.” No, it’s of course a very difficult situation, the fate of Nagy, in Hungary. Yes?

Burnett: [7-00:19:31] Oh, Nagy? Imre Nagy?

Černohorský: [7-00:19:32] When our delegation were brought to Moscow, but there was one, [František] Kriegel, who didn’t sign. And I am not sure what would have happened if the delegation had said, “Please. You have the power. Unfortunately, you can do what you will, but, without us.” But you know, if somebody is in danger of his own life, and not only his own life, but the life of his family, yes? Then...[makes gesture]

Burnett: [7-00:20:35] So you were occupied for the second time? In your life you experienced occupation twice.

Černohorský: [7-00:20:50] Yes, of course, this occupation was something very— There is no comparison in that sense, that it would be similar, because, in the whole of history, the Czech Nation was surrounded by these German areas, yes? But for the Russians, we had very much sympathy. Not only because of the veterans of World War II yes. Of course, history tells us more, Havlicek in the 19th century [Karel Havlicek Borovsky] and others, so also another Russian only our friends. But anyway, Germans and Russians, this was quite another thing. There were not many people of the kind of George Placzek, who were able to see, to have insight into the basis of the system. And World War II, what the Nazis did in the war.

Burnett: [7-00:23:11] So it was much worse, the occupation of Czechoslovakia by the Germans?

Černohorský: [7-00:23:20] Of course, yes, but in some respects, somebody would say the same.

Burnett: [7-00:23:33] Oh, some people would say it was the same type of—

Černohorský: [7-00:23:37] You know, that depends very much on the surroundings in which you are living. Coming back to Darmstadt, there were some people who said to me, of course, before the end of the war, “It is a very bad situation for us because, if they knew something about what the Nazis had done with Jews and so on, there was the Nuremberg tribunal? Yes? [Hermann Wilhelm] Göring? So the 60s, anyway, the occupation was while the times were changing to the democracy. Now, it would be necessary to stop it. Yes. Then, experience for occupation, number one, this was my 60s. Personally, at the end of the 60s, I was appointed assistant professor, not from my initiative. And it was very agreeable to hear that the opponents say it. And my students, when I was then professor, they said, “ You *were* our professor.”

Burnett: [7-00:26:17] You were *already* a professor, to them!

Černohorský: [7-00:26:22] But I was accustomed from childhood not to give more emphasis on these external positions.

Burnett: [7-00:26:43] You did not allow it to inflate your ego, for example.

Černohorský: [7-00:26:51] Yes, you learn. First of all, in the childhood when I remember, very much to be oneself. Maybe it's not to the point, but perhaps. The boys were not quiet in waiting for the lunch. And so the lady, the educator said, "Please, you are doing such bad work, no lunch!" And so no, of course, it was not bad, but I talked to my mates, "Please, it was said, no lunch, no lunch," and we three remained outside and got nothing, but these two betrayed me and they went. So I was alone.

Burnett: [7-00:28:38] So, I want to understand. The educator, the teacher said "no lunch" because your classmates were making too much noise.

Černohorský: [7-00:28:52] Yes.

Burnett: [7-00:28:53] Yes. So the discipline was no lunch.

Černohorský: [7-00:28:55] Yes.

Burnett: [7-00:28:57] But your two friends disappeared? Where did they go?

Černohorský: [7-00:29:02] And then, there was lunch, but we three did not go there. But, after a while, these two went too.

Burnett: [7-00:29:19] So they did get lunch. They went and took lunch anyway.

Černohorský: [7-00:29:24] And I was alone.

Burnett: [7-00:29:26] So you obeyed the teacher.

Černohorský: [7-00:29:31] No lunch.

Burnett: [7-00:29:32] "No lunch" meant no lunch and you did not have lunch.

Černohorský: [7-00:29:36] Yes, and after the lunch there was something to do on the [school] grounds, more order [drills] and so on, and by another educator I was told I should do this and this.

Burnett: [7-00:30:01] Okay. So another teacher told you to do more work.

Černohorský: [7-00:30:04] And I said, "I will do nothing. I had no lunch." You know, this is the thinking of one-year boy [first grade of elementary school] who feels that he is, not a personality, but that he is an individual who is able to understand that he has some something like rights, and this accompanies you through the whole life.

Burnett: [7-00:30:57] Yes, that's true. Things that happen to you in early life, they are these formative experiences.

Černohorský: [7-00:31:07] Now that was an [inaudible].

Burnett: [7-00:31:13] No, it's totally appropriate. But I'm also interpreting the story. You were punished as a group. Three people, three boys were punished by the teacher because—

Černohorský: [7-00:31:32] No, the whole group should have been punished. And the punishment was revoked. "And you can go, the whole group." But I with my two classmates, we said we would not go. But these two, after some time, went back. They returned then to me and said, "Go to the kitchen and you will be given *more* than the lunch." [laughter] That is what is in the memory.

Burnett: [7-00:32:30] So you refused to take lunch because—but you were forgiven! the teacher forgave you! You were not punished. But you said "No, I will be punished."

Černohorský: [7-00:32:55] No, not –this was not the feeling "I will be punished." Why? I didn't [make] no noise.

Burnett: [7-00:33:07] Oh! You did not make any noise.

Černohorský: [7-00:33:10] No.

Burnett: [7-00:33:10] So it [the punishment] was unjustified.

Černohorský: [7-00:33:12] There was a part of the group only. And I understood at that time already, even if not evidently, that there should be nothing like a collective punishment. No, when one is doing something wrong, which is not accepted – Germans, after the war, why three millions, if only a part, of course, a great part, but not all, and there were very good people among them, poor people who were living modestly, working hard, and why they should be punished because of—

Burnett: [7-00:34:44] the group.

Černohorský: [7-00:34:45] –another group. This is the problem of collective—

Burnett: [7-00:34:54] Justice?

Černohorský: [7-00:34:56] *Vina* [guilt].

Burnett: [7-00:35:00] Collective *sin*?

Černohorský: [7-00:35:01] No, no.

Burnett: [7-00:35:03] No, but I understand. Yeah, I appreciate it and it's a striking part of Czech history, the collective punishment of villages. [Reinhard] Heydrich was assassinated in World War II and Hitler destroyed the two villages in Czechoslovakia from which the assassins came.

Černohorský: [7-00:35:33] Lidice and Ležáky. Yes.

Burnett: [7-00:35:38] You remember that?

Černohorský: [7-00:35:39] Yes, I remember. Yes, of course I remember this.

Burnett: [7-00:35:44] Yeah, we did not talk about that. So, it was an injustice, the first punishment, saying “no lunch.” It was an injustice that you were accused. You were not part of that group.

Černohorský: [7-00:36:04] Yes.

Burnett: [7-00:36:04] And so even when they said, “Oh, go have your lunch; we have mercy on you.” You said no.

Černohorský: [7-00:36:12] I protested about the first [accusation].

Burnett: [7-00:36:17] “I was not responsible the first time.”

Černohorský: [7-00:36:21] Yes. Perhaps not characteristic of the 50s we are speaking about. In any case, these years were the years of building, really building the Institute [of Metals]; not only its policies but also to have a building!

Burnett: [7-00:37:09] To have literally a building.

Černohorský: [7-00:37:13] And I was entitled to have all these negotiations in Prague with these finances, what’s necessary to have such a project realized, with the architects. My conditions for my rooms, in the rooms of the physics departments, not great rooms for many people, but more small rooms. Physicists need quiet for their work and good acoustic –

Burnett: [7-00:38:04] insulation?

Černohorský: [7-00:38:06] That means in the building of the physics departments, the walls are stronger.

Burnett: [7-00:38:15] Yeah, it’s important, and equipment?

Černohorský: [7-00:38:23] Of course. That was the first – this was in the 60s.

Burnett: [7-00:38:34] At the end of the 1960s, how many people were employed at The Institute for Metals and Materials Research?

Černohorský: [7-00:38:47] This was the time when the Institute was growing. I mentioned already that I was [employee] number four. It should be for 150 and it grew more.

Burnett: [7-00:39:18] So there was a plan to grow the population of the size of the Institute to 150.

Černohorský: [7-00:39:34] Yes, but this was the time where it was growing slowly. It depended. In some departments, it was very quick. In the physics department, it was very slow, and some wondered why we were so slow because it could be dangerous insofar

that the rooms could be occupied by another institute or a laboratory for some time. But this “sometime,” this is sometimes forever!

Burnett: [7-00:40:37] Right, so it was a danger.

Černohorský: [7-00:40:40] But I insisted that we must be sure and this acceptance procedure was rather complicated insofar as I wanted the applicants to know what the work was like. That means, I invited them to work one afternoon and to see what their capabilities are, and to go through all our rooms and laboratories. I presented them to our employees, and I was very interested in the opinions of our people. One of my men said to me, “Doctor, if you accept this man, I will go away.”

Burnett: [7-00:42:06] So the attitude or the opinions of the current employees, how they felt about the new person.

Černohorský: [7-00:42:17] Yes, and I left them. not to be present and they could ask, yes, and then I heard what they are feeling.

Burnett: [7-00:42:35] So work culture is important to you.

Černohorský: [7-00:42:41] Yes, and therefore, the situation in our department was very open. As for the wages, and so we had every Monday at seven a meeting. Sometimes, within three minutes, the meeting was over. But sometimes we consulted half-an-hour about something and I informed our people. And when they said to me, please, the wages in other institutes are greater in comparison with ours. And I said, not wait a minute, but wait a few months, it will, be because our proposals *must* be accepted, not discussed. But they must be so well-prepared and I must have so much good material, that it will be impossible to say no to what I will propose.

Burnett: [7-00:44:07] So when you’re talking about proposals for the wages, you propose to the Ministry?

Černohorský: [7-00:44:17] No, no, to our director.

Burnett: [7-00:44:21] Okay, the director.

Černohorský: [7-00:44:23] There was for instance a period when people, the middle staff, quit academia because of low wages and therefore the academy made the wages of this middle staff higher, and university graduates maybe wanted the same level. And my people said to me, what is going on? And they asked me how is the income of these middle staff in comparison with them? And I had to explain to them, it’s not the way, not to accept this offer to make wages of the middle staff higher; the way is to give them wages as high as possible, and then to use that when I negotiate for your wages. No, that’s of course already something which is the general policy. That is the reason why I am doing my work at the university from 1998, when I finished with the position as Rector of the Silesian University at Masaryk University without any crowns [Czech koruna] –

Burnett: [7-00:46:55] Without pay, you did not receive a salary?

Černohorský: [7-00:47:01] Yes, in these 20 years, I was just an honorary teacher.

Burnett: [7-00:47:18] So you had your pension?

Černohorský: [7-00:47:21] I have my pension from the old hire.

Burnett: [7-00:47:23] Okay, so it was a voluntary position?

Černohorský: [7-00:47:28] Yes, when I finished. Now, directors have 130, 150,000 crowns [Czech koruna] per month. I ended up with 23,000.

Burnett: [7-00:47:54] Twenty three thousand?

Černohorský: [7-00:47:58] Twenty-three in 1998, 20 years ago. But, so, I am fully free. Because I know, if you have the situation where there is not enough money for the wages, maybe some people must perhaps be dismissed. If, at the same time, there are old [people there who have their wages], that's a bad situation. No, these are questions of general policy. But, you know, it was also my attitude speaking with my students about it. For instance, this Jiří Grygar, he's a wonderful popularizer [of science and he received a world appreciation [7-00:50:00] from UNESCO [the Kalinga Prize] for popularization of science. And our government established a prize for popularization of science and he was the first winner, and it was one half million of crowns [koruna] this prize and you can guess what he did, because it was in the time where some people were trying to abolish the Academy and in such a way that the Academy would receive less money. And the next year, less money, and the next, less.

Burnett: [7-00:51:22] They were reducing funding.

Černohorský: [7-00:51:26] And the reaction of Jiří Grygar to this situation was that he said to our government, "thank you. I am not interested in accepting something from a government who is doing such bad things for the institution I am working in." Half a million.

Burnett: [7-00:51:56] So he refused the prize as a political statement. What year was that? What year did Jiří Grygar refused the prize from UNESCO? [Dr. Grygar rejected a different prize from the Czech government, not the Kalinga Prize from UNESCO].

Černohorský: [7-00:52:13] Jiří Grygar began at the university in 1954. This is the fantastic group.

Burnett: [7-00:52:29] Yes, the important cohort of students that you had. But what year when did he refuse the prize?

Černohorský: [7-00:52:43] Some five years [ago] maybe?

Burnett: [7-00:52:47] Oh just 2013, 2012, something like that?

Černohorský: [7-00:52:53] Yes. Something like that. I don't remember this year. And I'm not sure of my memory in this.

Burnett: [7-00:53:08] So recently there has been a period of austerity for higher education in the Czech Republic. We should talk about that in a future session, the recent years. But from what you were telling me, in the 1960s, there was one part of your job, a big part of your job, was to keep people happy with their work and happy with their wages, and so there was competition for wages in Czechoslovakia at this time.

Černohorský: [7-00:54:03] No, this is just, this is nothing so very important. But it was such a situation.

Burnett: [7-00:54:18] People need to live and have a family, and so the so cost of living was a consideration for scientists and researchers in your Institute.

Černohorský: [7-00:54:38] This was also a time period when the graduates were told where they should go to work after graduation. So for instance, it would not be easy to get my students in to the Institute, because first the Academy must have a number of people who could be employed in the Academy as a whole. And now inside of the academy, fighting about who from this number is for our section, and inside of the technical section what part of this number is for the Institute? Therefore, I had to be active to ensure, first of all, that the Academy had a reasonable number. And when it was so, I was not fully successful, and I couldn't have all my students who graduated, and I would like to have, because the faculty said, "This is a [Communist] party member-not available." Yes?

Burnett: [7-00:56:48] And you were not a member of the party.

Černohorský: [7-00:56:52] No. If the faculty was not willing to have people I was interested in and who were not Party members, but it would not be good for the Faculty to have an important member of the Party taken away from them. Therefore, I could not have all my choices. And this was a very good man, I mean professionally, and also from insight into the situation, yes? A Party member doesn't mean this is a Communist. And then I had him, at least, but after two years...

Burnett: [7-00:58:25] So, times are changing in the 60s and 70s. I have here an interesting statistic. In 1966, only 9 percent of the Communist Party was under the age of 26. Nine percent, so 91 percent of the Party was older, and only 0.4 percent were students. So the younger generation is not interested in the Party or the Party is not interested in the young people. There is a tension obviously between the younger generation—

Černohorský: [7-00:59:42] It was both!

Burnett: [7-00:59:43] It was both; it was mutual, this mutual disrespect. So, your pool, your group from which you take your staff and your researchers, these are the young people coming through the University. So, what are the consequences for you in the 1970s? What are the consequences for the young people who are scientists who don't want to be in the Party? They don't want to be in the Communist Party.

Černohorský: [7-01:00:36] Of course, their situation was much worse than for the others. That's clear. Yes, and that's the reason why I was trying to do something so that these people, if they are good, are not lost. And therefore, to get them into the Academy.

And I was not successful in all cases. But when they were told to go to such and such factories and so on, then I negotiated to take them from the factories to the Institute.

Burnett: [7-01:01:52] Okay. So in general, the Czech Academy of Sciences was a place where talented scientists could go.

Černohorský: [7-01:02:08] Yes, yes. One can say that the Academy was also a place where people who, for the Communists, not acceptable at the university, were tolerated, though not in a leading position.

Burnett: [7-01:02:58] So, from the 60s to the 70s, I understand there was a change in Czech Society. The invasion of Czechoslovakia by the Soviet Union had an impact on something that was already changing. You were correct to say it was already changing. Young people were traveling more. Between January 1968 and April 1969, there were 700,000 trips, voyages to the West: to West Germany, to France, to Italy. People were learning more, young people, especially, were learning more about a different way of living. But 500,000 troops, soldiers, came into Czechoslovakia; six thousand tanks came into Czechoslovakia. This severe kind of reaction had an effect on Czech society, and there was retaliation against those who were considered to be the enemies of the Communist Party. You could have your citizenship removed or revoked. No driver's license. Educational opportunities for your children could be removed and you could lose opportunities for work and, in a way, it sounds like there was this difficult period again for scientists too.

Černohorský: [7-01:05:04] Of course.

Burnett: [7-01:05:05] So a young scientist becoming a PhD, and they want to have a job, but they are considered to be outside of the Party.

Černohorský: [7-01:05:17] For instance, Marie [Fojtíková] had no possibility to PhD.

Burnett: [7-01:05:29] To finish her PhD?

Černohorský: [7-01:05:31] Not allowed to.

Burnett: [7-01:05:35] So she did her master's degree. This is Marie Fojtíková, and she was not allowed to finish because she did not accept—

Černohorský: [7-01:05:49] —master's degree finished, but application to be allowed to study for PhD was not given.

Burnett: [7-01:06:05] And the reason why was what? Why was she not allowed to finish her PhD?

Černohorský: [7-01:06:17] This is a question?

Burnett: [7-01:06:17] Yes this is a question.

Černohorský: [7-01:06:23] It was characterized so that Marie is only *rosa*, not red.

Burnett: [7-01:06:39] Oh, she was pink. She was pink but not red.

Černohorský: [7-01:06:43] Yes, not bad, but not so good as to be...

Burnett: [7-01:06:54] Not good enough. She refused to join the Party. She was asked—

Černohorský: [7-01:07:00] If you join the Party...

Burnett: [7-01:07:03] Yes. So there were consequences.

Černohorský: [7-01:07:09] In this sense. It depends very much on the influence of teachers.

Burnett: [7-01:07:28] Were you able to help her?

Černohorský: [7-01:07:34] No, because I was not in a position to be able to help in this. This Minister Hrbeck, this minister during the normalization period. He gave a proclamation or document that all people at all universities should sign. And I was deputy director of our department of physics. The director was the famous Armin Delong, of electron microscopy, and when his predecessor Professor Vasicek died, then who would be the director? The best would be if it were a professor and if he were a member of the Party. At that time, Armin was not a professor, but was a member of the Party, but please, be careful. He, as director of the Institute of Scientific Instruments and the director of our Institute, it was only these two directors inside the whole Academy who opposed themselves to the demands to fire people according to the recommendation of the Party, only two directors.

Burnett: [7-01:10:08] Yeah, I think you spoke about that in a previous session.

Černohorský: [7-01:10:13] Yes, in this connection, it's important what you are asking about and I will try to explain. So I negotiated with Armin to take the position of the director [of the Institute of Metals]. He refused and said "please, if you are at the Institute, why should I go from the Academy? I explained to him, "Please, you must imagine, even when you are a member of the Party, I am not a professor. There is no chance that I could be director even if I would like to, which was not the case. And so then he accepted. Yes, so and now came this [Minister of Education Jaromir] Hrbeck [with a proclamation to sign¹] and I said I would not sign it and all people in our department said, "when you will not, we..."

Burnett: [7-01:11:52] Will not either? They all refused? They all refused.

Černohorský: [7-01:11:56] And I explained to them, "Please, not according to me [for my sake], because you had maybe children who should go to the schools and so on, various situations, to have elders to take care of."

Burnett: [7-01:12:19] So they would take away care for elderly people?

¹ <https://www.nybooks.com/articles/1969/12/04/letter-of-the-minister-of-education-to-all-employee/>

Černohorský: [7-01:12:25] Yes, because if you do not sign it there is a danger to be fired. But now I went to Armin and he said, “do you think you should sign?” I said, “I don’t know what you will do; I will not sign,” and our people had the solution: they signed the document, but over the signatures, we wrote “we have read it.” [laughter]

Burnett: [7-01:13:11] “We have read the document,” but not, “we agree with the document.”

Černohorský: [7-01:13:18] You can imagine what it means for the directors? And that is, at last they signed. Yes? And there were five people at the faculty who didn’t sign. Armin Delong had difficulties in the party with this, then of course, his was a such a capacity that they could do nothing. Yes? And all the others were fired. I was not. I asked why, and I had the answer because in some situations, I had such a strong position among the students that it might be so that they said to the Communists, “let him be.” It’s not the worst to [deny] these students something about which they could express their dissatisfaction.

Burnett: [7-01:15:04] So they did not want to provoke the students.

Černohorský: [7-01:15:09] This is my thinking. Therefore, I only survived. And this was also my policy before the Velvet Revolution, because when my time was over with the age, I finished in my department, but went–

Burnett: [7-01:15:50] What year was that?

Černohorský: [7-01:15:51] This was in ‘85, that means 1988, already shortly before the [Velvet Revolution], and there was another director in another department who offered to me to go to his department. And I wanted to be at the faculty because I knew in order to do something with the changes, one must be “in.” From outside? [makes dismissive gesture] Therefore, he said “not possible to be a teacher but as a research worker.” So I was accepted, not fully, only a half, a part-time worker. After a short time, he said to me I’m not able to be at this position only more short –

Burnett: [7-01:17:39] So he gave you a term, a contract term?

Černohorský: [7-01:17:43] The final statement was, “Not possible. There would be the only possibility to engage you at the department as a worker.” They had the feeling that I would be offended and I would go. But I knew even as a worker I would be in [the faculty of Masaryk University], and then when Václav Havel made his Proclamation at the Club in Prague at Friday at 10 pm in the evening, for the midnight, I had already the proclamation and I could, no, that’s about– this is another story, just that the influence on students could be very high.

Burnett: [7-01:19:01] That’s what you wanted. You wanted to be able to, well, you’re telling an example of the influence with the students.

Černohorský: [7-01:19:11] And you see that my position and my possibilities of what I could do are not so representative that I could give a good report about the political situation as the whole.

Burnett: [7-01:19:35] No, but no one can, you know?

Černohorský: [7-01:19:39] I do not know enough to be able to do something like that.

Burnett: [7-01:19:46] The only thing I will ask is about what you experienced, what you knew about that time, so there was a change. So, in other words, after '68, it permanently changed the attitude of young people to the Revolution. People did not believe in the Communist project anymore after the invasion, after the period of normalization. If there was support for the project, it was diminished a great deal after 1970s, early 1970s, and there was a response. There was an underground society Václav Havel. So Václav Havel with the Jiří Hajek and Jiří Nemec, they wrote Charter 77, saying that the Czech government refused to respect human rights and the Helsinki Accords and there was an underground political movement around change, for freedom, for human rights, and there was a circulation of ideas and poems and music. There was a cultural political underground in Czechoslovakia in the 1970s and into the 1980s. I would ask you to talk about the equivalent response from science, a scientific underground that circulated ideas, and ideas about science and information and samizdat. So, can you talk about samizdat, your participation in samizdat?

Černohorský: [7-01:22:57] These are two very different topics. If you spoke about science in general and if you take the topic of samizdat. The project of samizdat was of course connected to science, but in a very, I would say, narrow profile. What was important was that the publishing of some is that's were common in so many surroundings that it was let's say nothing special in Prague. In Brno. our samizdat, *Prameny*, "Sources" was the name, was not the only one but otherwise, it was rather the individual initiative of one or only several individuals. Only the dissemination, was, for instance, in Opava and in Northern Moravia, very very restricted. That was when I came to Opava and one of the first activities was this exhibition, "*Libri prohibiti*," only my own [books], what I had at home.

Burnett: [7-01:25:43] You're speaking of the exhibition—

Černohorský: [7-01:25:44] The exhibition *Ex Libris Prohibiti*, and this was my personal archive, and certainly not only samizdat edition *Prameny*, but what we had was about three hundred items at the exhibition. What I showed to you are just a few items, because I gave all the archive to the Center for Moravian Literature. This is something similar to the one in Prague, [where] there is a Center for Bohemian Literature. Science in general was of course in a special position because, for a mathematician, it is not so important to have a connection in comparison with experimental sciences, equipment and results. Of course this was not connections or contacts with those abroad. This is not possible. Therefore, we spoke a little about these things in connection with the activities of UNESCO and the International Union of Pure and Applied Physics and the International Union of Crystallography. Therefore, I think it was a rather great event when we were able to host when the International Union of Pure and Applied Physics in collaboration with UNESCO decided to do in 1980 the conference on postgraduate education of physicists in Prague. Therefore, for instance, [Robert] Resnick, this is one of the authors of the, let's say, best book "Physics for Newcomers" to universities. I spoke with him already some years before when he was in Prague and then in Brno, and I asked him what is in his opinion a good textbook of physics for newcomers and he even said this Halliday and Resnick [David Halliday, Robert Resnick, and Jearl Walker, *Fundamentals of*

Physics, NY: John Wiley & Sons, 1960], and he sent – Halliday/Resnick, these are authors of famous textbook, “*Physics for Newcomers*.”

Burnett: [7-01:30:17] Halliday and Resnick.

Černohorský: [7-01:30:22] And so I acquired this book and after some years it was translated and we have already the third edition of this.

Burnett: [7-01:30:37] But that was not samizdat.

Černohorský: [7-01:30:39] No, no.

Burnett: [7-01:30:40] It's part of the circulation of physics knowledge.

Černohorský: [7-01:30:45] And yes, now just only to samizdat, we had enough income from these titles because the “tourists” from abroad came to Czechoslovakia and gave us these books that were not available here and there were some translators who made it very operatively [did the work efficiently] and so we began in those times with Schrödinger's *Mind and Matter* translated by Marie [Fojtíková] and then followed some dozens of translations. You saw a few things from Popper.

Burnett: [7-01:32:06] Yes, Karl Popper.

Černohorský: [7-01:32:08] Karl Popper, we began in the days where it was necessary to have it typed on a classical machine.

Burnett: [7-01:32:21] These are hand-typed, yes.

Černohorský: [7-01:32:22] Only twelve copies could be done in one edition.

Burnett: [7-01:32:28] So you had no copier, like a photocopy. Did you have a photocopier or mimeograph?

Černohorský: [7-01:32:42] Yes, but then we had already from Oxford [University], we were gifted some equipment, because there was a Jan Hus Foundation in Oxford and in Paris to support this. Yes, and here, Jiří Zlatuška, at that time a student. After that, he was Rector of Masaryk University; now, he is Dean of the Faculty of Informatics [Computer Science or School of Information], which he founded this faculty in our University and is an expert in this field. So thanks to him, we began with better publishing possibilities and this dissemination was rather successful, of course, not thousands of people but maybe sometimes only tens or maybe hundreds of people. Nevertheless. It was important because these lectures of these “tourists” [visiting scholars] were so effective that, for instance, one of the post-Velvet-Revolution Rectors of Masaryk University, Petr Fiala, was there as a student, visiting all these English-spoken lectures. In our house, in [Milan] Jelínek's, we had these lectures in German and in French.

Burnett: [7-01:35:26] So you are speaking of Milan Jelínek, his apartment, that is where you would meet, and visiting scholars from outside of Czechoslovakia would give lectures about various topics, lectures that would be forbidden, normally? They would not give this lecture at the university, for example?

Černohorský: [7-01:36:04] No, only at his home or in our apartment.

Burnett: [7-01:36:14] So I read one history of this period, and one analysis was it was not many people, very many people involved in samizdat, but it was indicative of a change in Czech society where there was a new professional class, right? In the 1950s, you could speak of a working class that was more uniform. By the 1980s, it's differentiated. So you had educated people who were interested in learning about their own society, interested in communicating with the outside world and with each other about society, the purpose of life, all of these things, and it's interesting that one of the first titles you published was *What is Life?* I know it's about biology, but—

Černohorský: [7-01:37:34] Yes, and it was important because the young people could see what nonsense this is if it is not possible to expect that Einstein's essays could be published as he wrote them [unchanged].

Burnett: [7-01:38:05] So it was published in Czechoslovakia, but they removed pieces of his writing. It was not published completely. Is that right?

Černohorský: [7-01:38:17] Yes, and therefore we prepared Einstein's book *Out of My Later Years* for samizdat. There were some chapters that would certainly be left out if published by a state publisher.

Burnett: [7-01:38:43] The approved publisher.

Černohorský: [7-01:38:44] Yes.

Burnett: [7-01:38:45] Can you tell me what you remember of the Velvet Revolution? Can you tell me what you were doing, and what happened from your perspective?

Černohorský: [7-01:39:02] Yes. I am not sure of whether my personal reminiscences are so important, but if you are think what I remember, then I can, but it would be better to answer what *we* remember.

Burnett: [7-01:39:29] You are speaking of Marie.

Černohorský: [7-01:39:34] Yes. Then. If I remember how it began, with this proclamation of Václav Havel, I mentioned that I had it some half an hour after it was written already on my magnetophone [tape recorder]. Then the next day Marie began to work with it in the Institute of the Academy [Institute of Physics of the Czechoslovak Academy of Sciences] and I visited my Dean to ask him to intervene with the secret police not to do anything about demonstrations on our streets in Brno because there was this conflict in Prague. It was the point [where] it began. [7-01:41:00] What was very interesting that it was said that in the whole country on the next Monday, there would be at 1 o'clock, not to continue with work.

Fojtíková: [7-01:41:28] Strike.

Černohorský: [7-01:41:30] A strike, thank you. And the faculty of natural sciences had not decided whether they would join. Can you imagine this? And on Monday morning, there should be an assembly in great lecture room of the faculty and to have as result

whether faculty of natural sciences would join, because the leadership of the faculty was rather strong for the old regime. And at that meeting, I was prepared to read this Václav Havel proclamation. Yes, but I knew that my presence was not so important because I was in no good position. But my colleague was Eduard Schmidt, who was also, in one way, a victim of the regime because his brother was in Africa on a Christian mission and it was enough that Eduard could not habilitate.

Burnett: [7-01:44:09] What do you mean “habilitate?”

Černohorský: [7-01:44:12] To be able to be an assistant professor at the university. Bachelor’s degree, master’s degree, doctor’s degree, habilitation, which means “*dozent*” we say.

Burnett: [7-01:44:34] Okay. Well, assistant professor is the first rank [in Anglo-American system].

Černohorský: [7-01:44:38] Assistant professor, and nevertheless, he was in a rather good connection with the Communists as a trade-union functionary.

Burnett: [7-01:44:56] A representative of the trade union.

Černohorský: [7-01:45:00] And in a very good position because he was the chief of all the sections at the universities. So people liked him, and the regime was not against him. Therefore, I asked him to speak after me and the result was that the faculty of natural sciences [agreed to] join the strike. Maria was very active at the Academy; I was active at my previous Institute, and also from the faculty of Natural Sciences. And very active was the wife of Milan Jelínek. She was employed at the faculty of philosophy. So there would be a commission for the whole—not only for the individual faculties—but for the whole university. And then I was active in further steps with the Academy and with municipal sections to have for all Brno.

Fojtíková: [7-01:47:00] And also for all institutions of higher education in Brno. All universities joined.

Černohorský: [7-01:47:08] Yes. That was the case. As for the university, there was a problem because Milan Jelínek, as a former member of the party could be not so acceptable to be the rector of the University. But because only a very few people knew what he had done in the 70s and 80s for Czech culture with samizdat, but they knew he was a member of the [Communist] Party. Therefore, some actions were organized at the faculties meetings where he spoke and I wrote a summary of his profile to disseminate it to the faculties. I instructed him, “You must say in your introduction speech that you were a member of [the Party], and not wait to be asked.”

Burnett: [7-01:49:01] Yes, to get in front of the criticism.

Černohorský: [7-01:49:04] I was successful in something quite special. This was the only case when these municipal associations of these individuals declared Milan Jelínek as proper, as good to be a good rector, because it was settled that we would not influence the individual institutions to be in favor of somebody. This was the only case. For instance, Eduard Schmidt was the leader of our group. Then he became the president of

the faculty senate, then president of the senate of the university, rector of the university, etc.

Burnett: [7-01:50:43] So, the portrait or the picture of the Velvet Revolution from outside Czechoslovakia, was this revolution from below: from students, from young people, with a group of intellectuals who were poets and artists and literary people, and it always confused me a little bit that that was the story, because poets have influence, but not the kind of influence that can easily end a government necessarily. And so I always wondered that there must be people with connections to institutions who were able to persuade people behind the scenes that this was the right way to change society. And so there's this story that you were telling me—you said you were not important—but you were telling the story of intellectuals who are part of institutions, because Václav Havel was not inside an institution in a strong sense.

He was underground; many of these people were underground. But you are talking about heads of unions, associations of municipal workers, and the faculty of the universities in Brno and Prague. You needed to have the organic intellectuals who are part of institutions that had power, that were close to the Communist Party, if not actually in the Party, in order to effect the change, right? So this is an interesting story, I think, in the history of the Velvet Revolution, because it shows another set of mechanisms for effecting change. It's very difficult for a poet to challenge a tank. It's romantic and it's a seductive story, but without the people who are connected to power, without their support, it would not have happened peacefully, I think. So your role in this revolution was important and the role of Marie Fojtíková was important because it helped effect a peaceful transition because of your ability to persuade powerful people.

Černohorský: [7-01:54:16] That's right.

Burnett: [7-01:54:21] Perhaps we should pause, and we can start again in the afternoon.

Burnett: [8-00:00:00] This is Paul Burnett interviewing Dr. Martin Černohorský for the Černohorský oral history project and this is our 8th session on November 4th 2018, and we are here in the offices of the Rector of Masaryk University and we are continuing our conversation about the period of samizdat and your efforts to bring information from outside and to foster conversations among scientists and interested parties in the Czech Republic.

I wanted to ask. Off camera, you began to tell a story about Milan Jelínek and your travels to Poland with him. What year was this? Do you remember?

Černohorský: [8-00:01:30] Yes. I have connections with physicists from Bratislava, and in the autumn of 1989, there was a conference on culture of Middle Europe, and I was invited, or proposed to invite also Milan Jelínek with his presentation. And so we went to Poland at another place of the border than expected, because I knew that this would be hardly accessible and we would be at the border not successful to go to Poland. But before we came to the border, some three kilometers away, we were stopped, our car by the police and it was not the matter of transfer police [border security], but the police who were interested in the papers we had with us.

Burnett: [8-00:03:19] Oh, so they were [Czech] security, security police?

Černohorský: [8-00:03:22] Yes, security. And so when we came to the border, we could not continue with our traveling and were embarrassed. And this lasted for some eight or ten hours. The Polish part of this border patrol asked us, “What’s going on?” Milan Jelínek on their side explained to them and we were taken by different police. Milan Jelínek was rather excited and very strongly saying, “Please...”

Burnett: [8-00:04:31] So you were separated? You two were separated. He went with one police person, and you went with another?

Černohorský: [8-00:04:39] Yes, and we informed them of what we are doing. Yes, and there was a document with us stating what I will be doing and so on. The reason why we were so long at the border was that, for instance, in my case, the dean of the faculty was asked by telephone if I am this person, how dangerous or not dangerous—

Burnett: [8-00:05:24] Which dean, the dean from the Polish university?

Černohorský: [8-00:05:27] No, the dean of my faculty. They wanted to have more information about our persons. And in contrast to Jelínek’s kind of questions and comments, I was quite quiet and I said to our officers at the border, “Please, I suppose you are aware of the fact that you are doing something against our laws?” No. Nevertheless, we were not allowed and the conference was without us.

Burnett: [8-00:06:33] What were you doing that was against the law? What did they say was against the law? You said that they said to you, “You are doing something against the law?”

Černohorský: [8-00:06:50] I said to the officers at the border, “Why can I not go? Everything with my [papers] is in good order in accordance with *our* laws. And you must be aware of the fact that if you do not allow me to go to Poland, you are doing something against *our* laws.” Yes? Clear?

Burnett: [8-00:07:31] Yes, it is. [laughter]

Černohorský: [8-00:07:34] Yes, and of course, they were not interested in [contraband] food or something like that, what was allowed or not allowed to go, but they were interested in the papers of Jelinek. And I had in my car a calendar notebook, just kilometers, notes about my travels and the notes were in steno [stenographer’s short hand]. [laughs] This was very suspicious, full of numbers and –

Burnett: [8-00:08:22] Symbols, in code.

Černohorský: [8-00:08:25] When we returned, I wrote to our interior ministry and I had I complained, and that wanted my paper back.

Burnett: [8-00:08:55] Oh, did they take your paper, at the border?

Černohorský: [8-00:09:02] When I returned home to Brno, I wrote a complaint to the Interior Ministry about what happened and I insisted on immediately returning me my taken documents.

Burnett: [8-00:09:31] Which documents did they take? You said you complained to the Interior Minister.

Černohorský: [8-00:09:50] I complained that I wanted to have back what they on the border have taken from my car.

Burnett: [8-00:10:08] What did they take? What did they take from your car?

Černohorský: [8-00:10:13] This notebook, these notes. And so after some 10 or 14 days, I was invited to the office of the secret police and I was given my documents back. Yes, and I saw that the men who had my materials about me.

Burnett: [8-00:10:59] Yeah, your file.

Černohorský: [8-00:10:59] Something more than that. [pointing to interviewer’s pile of notes and papers].

Burnett: [8-00:11:04] So you saw your file? And it was big? It was thick?

Černohorský: [8-00:11:10] Yes. Yes, I saw my file. That’s all. Just, I feel it is a very effective way to negotiate with these people on the basis of the law.

Burnett: [8-00:11:41] Yes.

Černohorský: [8-00:11:42] Yes? When you know the laws and they do something against it and I say “Please, you must be aware...”

Burnett: [8-00:11:55] This is effective in many—a socialist country, a capitalist country. You're dealing with bureaucracy.

Černohorský: [8-00:12:05] And this was a few weeks before the Velvet Revolution.

Burnett: [8-00:12:11] Oh, really?

Černohorský: [8-00:12:13] Yes, and soon after that my dean, when we were together, by chance he apologized, because he was aware that he was involved.

Burnett: [8-00:12:37] Interesting.

Černohorský: [8-00:12:38] No. He did nothing.

Burnett: [8-00:12:47] Right, but the tables had turned a little bit. The power had changed a little bit. It's interesting.

Černohorský: [8-00:12:57] Just one mention more, because what Jelínek said to the Polish people, all these were sent in the evening over Radio Free Europe that Jelínek and Černohorský were not allowed to go.

Burnett: [8-00:13:24] It was announced on Radio Free Europe?

Černohorský: [8-00:13:27] On Radio Free Europe. Yes.

Burnett: [8-00:13:29] Interesting.

Černohorský: [8-00:13:30] Interesting. How? In Poland, the situation was another one. Yes. One said as a joke that the Polish dog goes over the border to Czechoslovakia to have food and that means to eat, and from Czechoslovakia, the dog goes over the border to Poland to speak freely. This difference, but it is a joke.

Burnett: [8-00:14:58] But the joke always tells you something, right?

Černohorský: [8-00:15:02] Yes. Yes. That's what was the situation.

Burnett: [8-00:15:08] One of the consequences of the Communist Regime in Czechoslovakia was this modification of history—

Černohorský: [8-00:15:25] —modification of—

Burnett: [8-00:15:26] —of history.

Černohorský: [8-00:15:27] —of history.

Burnett: [8-00:15:29] Some things are excluded. Some things are—

Černohorský: [8-00:15:34] Others explained.

Burnett: [8-00:15:35] Yeah, other things are modified; new explanations for older things. So one of the things that you are interested in as a scientist is the history of science. You are interested in the heritage of science in Brno, in Moravia, in this area. You are interested in the scientific achievements of Gregor Mendel, of Ernst Mach, of George, “Georg” Placzek. So these figures, some of them disappeared from history because they were not accepted as important–

Černohorský: [8-00:16:29] As for “Georg” Placzek, not disappeared, because [he was] not yet known.

Burnett: [8-00:16:37] Right.

Černohorský: [8-00:16:39] This is very simple in this respect. As for Ernst Mach and Mendel, other things [explain their changing place in history]. Yes, and I am interested in both these cases, because I could do something in one and also in the other case. Now what I will mention shortly. As for Mach, it was rather an important action, because I wanted to do something publicly visible. And there was the situation in 1988, 150 years from Mach’s birth. But what to do? Because at that time, when you would like to have a plaque, it was necessary to plan it for the next Five Year Plan.

Burnett: [8-00:18:32] Right, it had to be part of the Plan [The Czechoslovakian socialist economy was organized around five-year plans].

Černohorský: [8-00:18:36] For the next five-years plan, right and it was necessary to be approved by the highest *gremium* [board] of the Party, the highest of the Party.

Burnett: [8-00:18:58] Officer of the party, the highest level?

Černohorský: [8-00:19:02] What was Brezhnev and his people in Soviet Union?

Burnett: [8-00:19:17] The *politburo*? Secretary, General Secretary.

Černohorský: [8-00:19:30] General Secretary, the central committee of the Party. Yes. This was the *gremium* [political level] for approving that you have everything. Okay. I was certainly nothing like that of course. And I was in these years the president of the Brno branch of the Czechoslovak Union of Mathematicians and Physicists, and we had every year an annual meeting at the beginning of the year, and on this occasion to have a formal lecture. Jiří Komrská, a colleague of Jiří Grygar, [members of] the same group, these fantastic newcomers [of Černohorský’s first cohort of graduate students from the 1950s], lectured about Ernst Mach. And I didn’t of course ask anybody whether it was allowed or not. And this was the beginning. This was the first signal.

And then, I will be very short, in March, I proposed at a meeting of our branch committee to install, on May of that year, the 13th, to install at the birth house of Ernst Mach a plaque. My colleagues agreed of course, and I with Maria [Fojtíková] took on all this work. She proposed the text and we hired the man who made this plaque. That was very modest, a very modest thing, and my wife said maybe we will not be allowed to install it. “What would you do with the plaque?” “We will have at home the plaque.” [laughs] Naturally, there were various negotiations with the owner of the house. It was in the town of Brno. Yes, and then what was in the laws concerning having a plaque, and I never was

in the position that I asked, “Please be so kind and allow...” No. My procedure was, I came to the offices where there were also the architects who had to say whether this could be so, and in all places I came with the written document, “I announce to you that on 13 May *will be...*” And this was very interesting, because some people had no idea who Ernst Mach was and some people were very well informed. And they didn’t ask me because for them, I was feeling it, and I was a very dangerous person, because I am coming to announce. “What kind of person must I be who installs Mach’s plaque?”

Burnett: [8-00:25:12] Without permission.

Černohorský: [8-00:25:16] Without, and it was a great manifestation because we informed the people of *Hlavnice*. This is the suburb where his birthplace is, and we connected it with various seminars, lectures for the public. This was the evening before. The room was full. We had an exhibition. I had a lecture with many of Mach’s experiments and with literature. It was a cultural event. It was interesting. Before, there was in front of the house, from 1938, one hundred years after the birth of Mach, there was a wonderful bronze plaque. The fate of this, it disappeared during the Communist time, and I had written some thirty pages with documents about the history of this. This was a very interesting event in 1938, because it was already after Hitler’s occupation of Austria and in the year of Munich [the Munich Accord], and in Brno, a German institution and the Union of Czechoslovak Electrical Engineers were in collaboration, good cooperation, [and mounted] this bronze plaque with two inscriptions: one in Czech, one in German. That’s also a good example of the possibility of cultural cooperation. This was the case for Mach. As for Mendel, I have this interesting story. When I was Rector in Opava, there is the border, and formerly, there were many Germans [who lived in that region before World War II]. So people from Baden-Württemberg, Bayern, from Germany, came to see where their father or mother was born and so on. And one Sunday was such a group of tourists from Stuttgart and Baden-Württemberg and they asked me to give them a lecture about the founding and evolution of the Silesian University because they said it was unbelievable what they have heard, that there is a new University in Silesia in Opava and after five years in such a state, because there had been no formal higher education institution in Opava. It’s unbelievable that after five years, there could be a university in such a state. And they would like to know what’s true of this, and they were right because the foundation and what we did to bring the university into the Union of European Universities was something very special and not in an ordinary way. And in these discussions with a lady from Stuttgart, we came also to Mendel, because Mendel was at gymnasium [high school] in Opava. And I said to her, unfortunately, nowadays is a bad situation with the original paper. If the original manuscript of Mendel’s paper from 1865 published in 1866. Sixty-five was the lecture, sixty-six was the publication. It is not known where the original manuscript is and who the owner is. And imagine this lady was a member of the municipal leaders, this *gremium* of Stuttgart–

Burnett: [8-00:32:16] City Council?

Černohorský: [8-00:32:18] –said to me, “The paper is in Stuttgart and it is in the hands of our *Väter*.”

Burnett: [8-00:32:38] Of Stuttgart, the mayor?

Černohorský: [8-00:32:43] Stuttgart is the town, and *Väter*, from religious–

Burnett: [8-00:32:54] Oh, yes. Okay, like the monks.

Černohorský: [8-00:32:57] I was speaking with this lady of Stuttgart of course in German.

Burnett: [8-00:33:06] The “Fathers” of Stuttgart.

Černohorský: [8-00:33:12] Unbelievable, yes? And so, I immediately informed our people in the Mendel Museum that and I was surprised that for them it was new information, and I proposed to inform our diplomats to try to do some exchange because, when the Germans after the war were pulled out, then at the border some documents from there, first of all, what could be precious was taken. And so Mendel’s letters to his nephew were taken. But in the meantime, this was 1986 and the official in the Mendel Museum office, Mrs. Matalova, this office secretary showed me a paper published in Darmstadt in 1982, four years before, and this was ten pages of memories of this nephew and attached, not a reprint, but a facsimile of the original manuscript of Mendel’s, and so he gave me this. I have it, and I had some tens of copies and I am giving these copies to experts on Mendel. So they are very proud to having such something which is so valuable.

Burnett: [8-00:36:29] And it was authenticated? It was his paper from 1866? It was approved as real? It was real?

Černohorský: [8-00:36:46] Of course. Yes, without doubt, because there is also proof there that from this exemplar [original copy] it would be printed. There is a note of the printer. I am very glad to have this and to disseminate it.

Burnett: [8-00:37:19] Yes, absolutely. So you talked about the unveiling of the plaque for Ernst Mach in 1938. So there was this cooperation. But you updated this. You had something in 19–

Černohorský: [8-00:37:40] Yes, of course, because the first plaque from 1938 had a valuable portrait relief of Mach; our plaque from 1988 was very modest. Yeah, and therefore after 20 years, in 2008, we held another celebration of Mach and to have a *relief* and so here is the plaque and there the relief of his of his face. Yes and two years ago, there was a great conference in Vienna to commemorate the hundred years–

Burnett: [8-00:38:59] The centennial?

Černohorský: [8-00:39:07] [For] the century after the death of Mach, I did research where there is a connection between Mach’s view of Newton. There is my paper in the proceedings of this conference. Now in several weeks it will be issued by Springer.

Burnett: [8-00:40:02] Great!

Černohorský: [8-00:40:02] Yes, I decided to give it in German, not before the conference, which was in Vienna. The proceedings are partly in German, partly in English. It would certainly be better to give it English, but I wanted not to exclude the possibility of publishing it in *Nature*, and there is of course a very strict [policy of *Nature*]: nothing that is already published can be published with us. Maybe it [can be]

published in another language than English, but this exception, they didn't accept. [laughs] No, this is another the story. Of course, Ernst Mach was born in Brno, similarly with Gödel.

Burnett: [8-00:41:28] Kurt Gödel was from here, yes.

Černohorský: [8-00:41:35] According to our example, the mathematicians of the Union [of Czech Physicists and Mathematicians] gave a plaque to Gödel, and it is in the neighborhood of the Mendel Museum, Gödel's birthplace. Mendel was not born in Brno.

Burnett: [8-00:42:14] And he was born, he was from Opava?

Černohorský: [8-00:42:16] Not in Opava, only in gymnasium. Hynčice is the name of the place where he was born, which is on the border between Moravia and Silesia. And then there is a great debt to the Placzeks. Yes, and in this respect we can be very satisfied. We are glad that we were successful in gaining several Placzeks. In 2005, the 100th anniversary of the birth of Georg Placzek and fifty years from his suicide, yes? And in 2005, Tony Placzek was for the first time in Brno. And he was, let's say, the man who spoke for Placzek's family when the plaque was unveiled. And Tony Placzek had an idea to do something for Brno universities, because Placzek's family [once] owned some several houses in Brno. Unfortunately, the attempt to reclaim them came too late and was no longer in accordance with the law of restitution.

Burnett: [8-00:44:57] Right? So you're speaking of, as survivors of the Holocaust, the Placzek family were entitled, within a certain timeframe, to petition to have their property returned to them. But there was a limit on the time.

Černohorský: [8-00:45:20] Yes, and it was missed. But Marie [Fojtíková], me and first of all, of course, Tony Placzek, negotiated about this intention to do something for the university life, and this is the beginning of the Georg Placzek scholarship for students who go to a good university to study physics. And so it is already several years ago, some ten years. It is very successful. Tony was several times in Brno at this board for this scholarship, and so for instance recently at the seminar in September he was here.

Burnett: [8-00:46:56] Right, most recently, he was at the seminar in September, and so there's a board that reviews applications. There are applications or nominations for the scholarship for the students?

Černohorský: [8-00:47:13] Yes.

Burnett: [8-00:47:13] And do you participate? Do you review the applications?

Černohorský: [8-00:47:19] I am president of this commission.

Burnett: [8-00:47:21] Okay. So yes, you do. How many applications do you receive?

Černohorský: [8-00:47:27] Nine, this year. No, this is better than in the previous years because we are making some adjustments to disseminate knowledge of it, to awaken the interest, but it is so with various scholarships or prizes of this kind. For instance, Siemens Czechoslovakia may have a great program with an endowment of about one and a half

billions, but if you know, as a student, that there are two scholarships and it is for the whole country, what is the probability that I can be successful? And this is why some good students do not apply.

Burnett: [8-00:48:53] This is a huge problem for scholarships. Many scholarships are not awarded. They're unclaimed, because students don't know or they don't believe they will be successful.

Černohorský: [8-00:49:06] Or have a better possibility.

Burnett: [8-00:49:08] Right? Right exactly.

Černohorský: [8-00:49:11] In any case what Tony [Placzek] was doing is a very good job.

Burnett: [8-00:49:19] Important.

Černohorský: [8-00:49:20] Important.

Burnett: [8-00:49:21] Yeah, on the one hand you remember George Placzek; on the second—

Černohorský: [8-00:49:27] And I cannot understand how it is possible that Georg Placzek's presence in the leading group for the Manhattan Project is not better known among our citizens of Brno, and even among physicists.

Burnett: [8-00:49:59] Yes, he did not promote himself, as Ales Gottvald mentioned in an earlier interview. Many physicists are known because of their papers. Their publications are numerous and they wanted to be recognized and George Placzek did not publish much. But he was influential to those around him. He was very, very influential.

Černohorský: [8-00:50:29] You say, Placzek did not publish much, or, he published, but he was not eager to be known.

Burnett: [8-00:50:41] No. Yeah, it's true.

Černohorský: [8-00:50:43] He was interested in matter. Yes? For instance, there is a story of Otto Frisch, and with Georg's proposal for the experiment to prove the theory/explanation of fission, something unique in the history of physics.

Burnett: [8-00:51:22] And the history of the world, very consequential.

Černohorský: [8-00:51:28] First of all, he was aware of the fact that it is important to have the [atomic] bomb sooner, not only sooner than Hitler, but also sooner than Stalin. This was not quite clear for many, including, I think that's my personal view, Oppenheimer.

Burnett: [8-00:52:03] Well, of those physicists, of that group, George Placzek had a bad experience with the Nazis, and had a bad experience with the Soviets, both personal, bad experiences.

Černohorský: [8-00:52:19] Of course, here is a great difference because as for the Nazis, it was the fate of the Placzek family. But as for Georg, this was this isolated experience with his visit to [Lev Davidovitch] Landau, the second visit to Kharkov. This is incomparable, but he was inside the basis of the regime.

Burnett: [8-00:53:11] Friends of his were tortured and family members of the friends who were tortured blamed, to some degree, blamed George. They said “do something,” but he could not, because he was under pressure from the Americans, “Do not have contact with the Soviet Union,” right? So he was under tremendous pressure. So he knew the bad behavior of the Soviet security forces; he understood that they were similar in their approach to the Nazis in terms of the effect they had on people, so it’s a dramatic story and it’s one that deserves to be remembered now. I want to ask you then, in a way, to think about the celebration of Martin Černohorský, as a scientist, a Czech scientist. You have been celebrated; you have been recognized in your life. I’m wondering, can you tell me about the awards and recognition of Professor Černohorský?

Černohorský: [8-00:54:51] Hmm. That’s rather simple. [laughs] I have of course various celebrations of different kinds, but what is the main in these subjects, these are perhaps—the [Czech] Academy of Sciences awarded me a medal in celebration, their *scientia et humanitate optimaе emeritus*, the highest celebration of our Academy of Sciences. There may be only one from the Academy, a special one, for instance for technical sciences, the Krijyc’s medal. This is perhaps the most valuable. What is special is the medal of Ernst Mach for achievements in physical science. This was just to mention this because the various sections of science of the Academy had these highest in the professional category, from biology. mathematics, etc. and it’s based on a Czech scientist, [Jan Evangelista] Purkyně, [Jindřich] Bačkovský for history, yes? And Marcus Amartsi should be for physics, but, there was also a proposal: Mach. Of course, Mach is Czech-German. That’s a very special thing, and what was decisive was that we had this book, *Homage to Ernst Mach*, which was the material from the year 1988 in connection with unveiling this plaque, because there are various papers that show that Mach was not against establishing a Czech university in Prague. Yes? It was divided [into Czech and German sections] and he was against the division of the university in Prague. He said Vienna is not giving money enough for *one* university. If we divide them, both will be poor. That was why he was not establishing Czech university but against dividing, yes? No, it was divided.

Burnett: [8-00:59:11] But just to be clear, he was talking about the German University in Prague becoming Charles University on the one side—

Černohorský: [8-00:59:24] Charles-Ferdinand University. Czech physics would have been very different without Mach, an interesting history with his eventually coming back to Graz and to what was very much involved the lady who was in connection with [Ludwig] Boltzmann, yes, his later wife who was interested that Boltzmann would come to Graz. That’s an interesting story. So coming back to this, that means I mentioned this celebration with this Mach. That was the Academy of Sciences and then several appreciations of individual works.

Burnett: [8-01:00:50] And that was 1998 that you received.

Černohorský: [8-01:01:05] ‘98. No, this is nothing. What do you think this Komenski, in the list you have? This is the Academy of the Czech Republic. This one, that’s 1998 [pointing to list of awards]. No, this is the first. And why do you say ninety eight?

Burnett: [8-01:01:56] These are recognitions. Different universities have recognized you. Charles University in Prague.

Černohorský: [8-01:02:12] Charles University, you know, Charles University, these are some cases not very valuable. This is because for instance when all rectors are together, and the rector of a university in his office gives to all the rectors a medal, and one says it’s for the merits of, etc.

Burnett: [8-01:03:11] Well, let me divide it then. Why don’t you tell me the most significant award for your service, not as a scientist, but as an administrator? What’s the most meaningful recognition you had for your service as Rector or as an administrator?

Černohorský: [8-01:03:38] For me, the most significant celebration is when I am given an information from somebody who was my student, and [who] at some occasion says, “Please, what I have from your teaching, from your lectures that influenced my life very much.” I oppose. [Burnett laughs] I disagreed, and I said you must consider that if you are a freshman at the university, this is something so new that it remains in the memory very intensely.

Burnett: [8-01:04:47] So you were being very rational in your disagreement.

Černohorský: [8-01:04:52] Yes, please, there were certainly, and some of them said, no, disagreed and he gave me perhaps an example. So that’s my reaction to your [question], but as for the institution, I am very glad when I have some medals with written documents, and then in this document is something special, and this is for instance the Silesian University, and also at the Faculty of [Natural Sciences of] Masaryk University where there is, not only a standard phrase, but something special about my kind of negotiations with people.

Burnett: [8-01:06:16] Hmm. Yes, the way you relate to people.

Černohorský: [8-01:06:19] Yes, because for instance at the Silesian University, there were people who were hired in not a good manner in the former times [before the Velvet Revolution?], and there were new universities, and not only new universities where there are some processes, tribunals with these people, and dismissing them. And in the Silesian University, no process [trials?], and people who should not be there, were not there. You know, I had a special way of dealing with this. It’s interesting, but I feel like I’m going to this perhaps –

Burnett: [8-01:07:28] Too much detail? No, I don’t think so.

Černohorský: [8-01:07:32] An example, [at the time of] the Velvet Revolution, as Silesian University was founded, and among people employed there by my provisional predecessor, before I became a Rector, I had visitors, individuals or groups, [who were asking], “Please, what’s going on? How is it possible that so-and-so is employed here?”

Burnett: [8-01:08:16] Right, because they were Communists or they were associated?

Černohorský: [8-01:08:21] Because, this lady was fired immediately and now she is on your personal staff. What would you do? The best is, if it is impossible to have employed such a person that she of her own will quits the position. Of course, how to... In this case, she prepared for me what I had to sign as outgoing documents, and I had a negotiation with some people, and I asked her to come in my room and I didn't interrupt the negotiation with these people, just to go a little away to [let them] do their things, but as a testament to show them what I am dealing with this lady: "Yes, and please, here in this sentence, please read again. Do you not wish to change it? It's okay?" She said "Yes, it's okay," and I said, "It's okay, really? And what about this punctuation?" You know, if you have a long sentence, and in the middle you need to divide—

Burnett: [8-01:11:01] Yes with punctuation. You asked about her punctuation?

Černohorský: [8-01:11:16] Yes, forgotten to write it.

Burnett: [8-01:11:22] Like a period or something; like a semicolon?

Černohorský: [8-01:11:42] Semicolon or something simpler. [pause]

Burnett: [8-01:11:52] We discovered it's a comma. So there was a comma in the statement—?

Černohorský: [8-01:12:11] It was missing, and if you do something like that, this is not to be offended, just to explain that you have done this work and it is not right in all aspects. And if you do it twice, the lady knows that if she doesn't go of her own free will, she will not be accepted and she prefers to say, "Please, I would like to dismiss our contract." And there is no court, nothing, and to have a feeling for problems, not only of your collaborators/ academics, but also for the people at the lowest [level], the lady who makes rooms.

Burnett: [8-01:14:21] Sure. Yeah. Everybody deserves respect. So your position is: respect everybody.

Černohorský: [8-01:14:29] [Quite] so.

Burnett: [8-01:14:31] Right, yes. So, just to clarify, this was [shortly after] the Velvet Revolution, and after you were the new Rector of Opava University. But there were employees who had been appointed by the previous [administration].

Černohorský: [8-01:14:52] Yes.

Burnett: [8-01:14:54] And so they were they were not chosen by you. And some staff were complaining, "That person was given a job because they have a friend in the Communist [Party]." So they're not qualified. They're not qualified for that job. It was a political appointment.

Černohorský: [8-01:15:13] Yes. That's the point.

Burnett: [8-01:15:15] Okay, and so they [the new authorities] said, “Just fire them; just get rid of them.”

Černohorský: [8-01:15:18] Yes.

Burnett: [8-01:15:19] And you said no, no, no. That’s not right. We must talk to her and ask her, “Are you really qualified?” And you pointed to her work, and you said, “This is not right.”

Černohorský: [8-01:15:34] And as for the qualifications for a driver, how many applicants would you expect that we had for the driver of the rector?

Burnett: [8-01:15:59] One?

Černohorský: [8-01:16:00] How many? 223.

Burnett: [8-01:16:07] Oh my goodness!

Černohorský: [8-01:16:08] And now to choose from 223, you can have a three-member commission to do this job, but it might be that one of them has a favorite.

Burnett: [8-01:16:28] Of course.

Černohorský: [8-01:16:31] And my system was, 223 [prospective] drivers, that means a test. At this examination they would profess knowledge of the laws. That’s for the driver [qualification], and you have no more 223, and then, oral interviews with some selected. And I [went] back to this three-member commission to propose to me, not one, but three. If somebody has his favorite, he can influence the Commission in so much as the favorite is there, but only one of the three. And with these three I am speaking. And that is the result, and it is was for the best, because I was, let’s say, a little proud of my driver or when we came to the castle. The impression of some people was that the man who is getting out of the car was the Rector.

Burnett: [8-01:18:25] So he looked good.

Černohorský: [8-01:18:26] Yes. Yes, of course, the drivers [normally] were not very well-dressed.

Burnett: [8-01:18:36] Yes, he had the right look. So this is important to pay attention to quality.

Černohorský: [8-01:18:52] Quality, and to be interested in what is about his children. Yes. Normal.

Burnett: [8-01:19:13] Yeah, normal human interaction.

Černohorský: [8-01:19:15] Normal communication.

Burnett: [8-01:19:17] So you don’t like hierarchy. If someone is in a higher position, it’s not that they are a better human being.

Černohorský: [8-01:19:32] Yes.

Burnett: [8-01:19:32] They have more qualifications, more education, more skill, but they're not better human beings.

Černohorský: [8-01:19:41] And then there are situations when it's chance, which is of help. So I am the founder of the Czech Rector's Conference, but perhaps what you have in your head if you hear I am founder of the Czech Rector's Conference. After the Velvet Revolution, we were already prepared to negotiate, in connection with this underground [Underground University] what to do with it and whether [to associate] with the new university or not. Somebody said, "It's not possible to found new universities; we have not enough money for this." We have! And we, with Milan Jelínek, were for the Silesian University in Opava. And if somebody argued like this, at least he [Jelínek] said, "Well, then it will be a better gymnasium, but we need it in such a region where education is so neglected." We need some, and it's so, for instance, when [Czech President] Václav Klaus was in the university in the beginning, I hoped he would say something which would be very good for the beginning staff. But he said, "Universities should be founded where the conditions are right."

Burnett: [8-01:22:22] Yes, you told this story in a previous session in July.

Černohorský: [8-01:22:28] Then I do not need it to repeat it.

Burnett: [8-01:22:33] Yeah, but absolutely, this is important. I did want to ask you about the celebration in September of 2018 this year. Can you describe it? It was a big week for Dr. Černohorský.

Černohorský: [8-01:23:06] I must say that I was very satisfied with the fact that it was not on me to organize something, and as, for instance, for the Silesian University, it was the Institute of Mathematics where I am member of the Scientific Council. I am of course also a member of the University Council, but it was this institute that organized a normal mathematical seminar as a *solemnus* seminar in my celebrations where I would have to say something about, not only mathematics, but also something accessible for historians, for linguists. etc. And this was the topic about Newton, so we had the session of the council between 11:30 till 12. After that, till 1:30 this seminar, after that, a social meeting with lunch. And then in the evening, my meeting with my not family, but my broader family.

Burnett: [8-01:25:24] Yes, colleagues and friends.

Černohorský: [8-01:25:27] And as for this week, it was our Institute with the Brno branch of the Union [of Czech Physicists and Mathematicians] and this astonishing visit of Tony.

Burnett: [8-01:25:54] Tony Placzek.

Černohorský: [8-01:25:56] Yes, Tony Placzek. This was the high point of the celebration, because to come to such a seminar from California, it's something. In Prague, I had this state celebration in the Senate of the parliament.

Burnett: [8-01:26:37] Of the parliament!

Černohorský: [8-01:26:38] Yes the Senate of the parliament.

Burnett: [8-01:26:40] Wow, I did not know that. Tell me about this.

Černohorský: [8-01:26:46] No, this is something which happens every year for about twenty people. It was a very well organized event. Very sympathetic.

Burnett: [8-01:27:13] I see. There's a picture of you though. It is in your CV, and you received an award or medal or a celebration from President [Václav] Havel? Didn't you at one point, from President Havel?

Černohorský: [8-01:27:38] No, no. Václav Havel, no. There was a proposal. I don't know who was at the time president, but it was the proposal from the Senate. And Klaus was president.

Burnett: [8-01:28:20] But you have met Havel.

Černohorský: [8-01:28:27] The president has the right to choose from the proposals, and he didn't.

Burnett: [8-01:28:40] Okay. No, but it was an extraordinary week, a very busy week of celebrations in Brno and—

Černohorský: [8-01:28:52] Prague and Opava.

Burnett: [8-01:28:56] I know, it's an incredible testimony to the esteem in which your colleagues, your former colleagues and your former students hold you. The time and the effort that you have made to have an impact in their lives, to have an impact on the future of the Czech Republic, I think that's something very special.

Černohorský: [8-01:29:31] Yes in the last decades, it is the matter of the Academic Forum. This is something with great impact, because we are sending the materials of these seminars to more than 900, about 1,000 addresses to all ministries and ministers and various authorities, and so it is well known even if the seminar itself is not visited by as many people as this close circle of interested parties. But the materials are known very well as it's criticism, first of all, in education and in science. And so it is known because, I have no office for this and all what is connected with it. That means negotiation with the speakers, and to arrange this and all administrative work, only me. Therefore, I am not anymore able to continue. I am too slow.

Burnett: [8-01:31:39] [laughter] Well, we talked about Karl Popper.

Černohorský: [8-01:31:46] As for Havel, I had some books when I met with him. I used the opportunity to give him some samizdat [materials], and most of them were in the center of Moravia, as I said to you.

Burnett: [8-01:32:13] Yes, they are *Ex libris prohibiti*.

Černohorský: [8-01:32:17] And then sometimes we'd be there together. There were some meetings when I had the opportunity to speak with him privately.

Burnett: [8-01:32:34] Right, right. So, one of the samizdats that you brought in was Karl Popper. You are interested in philosophy of science, and I wanted to ask you about the role of science in society in addition to scientific research.

Černohorský: [8-01:33:08] The value of science in society?

Burnett: [8-01:33:13] The role, the value of a scientific view, it's worth, of a scientific perspective or a scientific method or way of thinking, outside of scientific research. Does it have a value in life? Do you find it valuable to see the world as a scientist? Does it help you in administration? Does it help you in politics? Does it help you in life?

Černohorský: [8-01:34:15] Of course, there are many regions where you have a great advantage if you are accustomed and if you are able and if you have this knowledge. But the scientific attitude itself would be not enough to have insight into what in the human life is of value. Only rational attitude is not bad but, in any case, there are also other feelings, which one should have in his luggage.

Burnett: [8-01:35:52] Yes. There are moral questions in addition to the scientific.

Černohorský: [8-01:36:00] But as for education, without a rational scientific attitude, it would be hardly possible to organize society in a reasonable way.

Burnett: [8-01:36:23] Well, by definition, I guess. Do you think it helped your credibility with other people? My impression is that, when you spoke with other people or negotiated, you did not negotiate or argue for Martin Černohorský; you argued for the best outcome, the best result for the question, for the problem.

Černohorský: [8-01:37:04] That's the point.

Burnett: [8-01:37:05] That's your value, your ethic: "I must think of the best solution for—"

Černohorský: [8-01:37:15] –the whole." Of course.

Burnett: [8-01:37:22] And people valued that. They saw, "I can trust him," because, in this time period, it was a world of people [who thought], "I need to take my personal advantage." They're ambitious; they're jealous. And you appear to have a different orientation, a different spirit. Is that correct?

Černohorský: [8-01:37:54] You are right. That's the feeling one has if I hear that one of my students say to his parents who are interested that he goes in the Party and when he opposed: "Nothing like that so long as the party has a bad attitude to Černohorský."

Burnett: [8-01:38:38] Right, so people really respected you and they defended you from the negative attitude of members of the Party.

Černohorský: [8-01:38:59] One can say, otherwise, I would hardly have survived in the society under this previous regime.

Burnett: [8-01:39:29] Well, I think that you were not in direct opposition to the Party; but you were not in favor of the Party either. You were in opposition to the restrictions of the Party, the efforts to limit the opportunities of students. This is something you did not like. Your purpose was to do science; your purpose was to teach. Your purpose was to help, and so to that degree, it would have been counterproductive to make you a martyr, to make you an enemy, because that would have made them more enemies. If you eliminate Professor Černohorský, and you have 10 students or 20 or more who are angry or who will organize to oppose the Party. So you had a degree of control, but you were not interested in exercising it; you simply wanted to protect people. You wanted to help people, and you wanted to do science because you love science.

Černohorský: [8-01:41:15] Maybe.

Burnett: [8-01:41:16] [laughter] Maybe. Possibly? So it is now 2018 and it has been now, oh my goodness, almost 30 years since the Velvet Revolution, 25, 27 years since the dawn of the Czech Republic. With respect to education and scientific research in the Czech Republic, what do you feel is going well, and what do you feel needs to be improved going into the future?

Černohorský: [8-01:42:12] No, it depends how you would be restrict the question as for the institution or in some respect because it's a very broad topic. To react to it, one is in a bad situation without nearer—

Burnett: [8-01:43:02] A narrower definition.

Černohorský: [8-01:43:05] Yes. Could you—

Burnett: [8-01:43:07] —be more precise? Certainly, to take scientific research, do you think there are good opportunities or better opportunities for a young person in the Czech Republic today to achieve their dreams to become a scientist, to become an engineer than 10 years ago?

Černohorský: [8-01:43:44] You mean, what is the situation of the younger generation? Yes. Yes, now is something quite different, because nowadays it would be impossible to say that Mendelism is something which is not acceptable, or this kind of thinking. This is freedom. It's quite clear that the situation changed dramatically.

Nothing, like Ernst Mach. Yes, there are various symptoms, which I have from also from my students who were present at the unveiling of the plaque and wrote to me what they had heard from the citizens of *Chrlice*, “Why was the former plaque destroyed and why was it no longer on the house?” Yes, and these features of the former life are no more here. That means the younger generation could hardly understand these times when only what came from the Soviet Union was the right way.

Burnett: [8-01:46:08] Right. So there's more freedom for young people to explore whatever they want. There's open borders; there's the Internet.

Černohorský: [8-01:46:21] Yes internet and these possibilities of techniques. This changes the matter, so, maybe more than the Velvet Revolution.

Burnett: [8-01:46:39] Maybe, maybe in some ways, at least with respect to science.

Černohorský: [8-01:46:50] And what's most important is this kind of thinking, what is given first of all with the natural scientist?

Burnett: [8-01:47:14] A critical orientation.

Černohorský: [8-01:47:17] Yes.

Burnett: [8-01:47:18] In the Royal Society of London, the motto is – you'll appreciate this—*nullius in verba*—"not by word alone." Don't take my word. Investigate, yourself; convince yourself. Don't take the authority of the king.

Černohorský: [8-01:47:45] It's very interesting in such matters when I inform my students that for instance Heisenberg's and Laue's words about the sense of Einstein's equation concerning matter and energy is not correct. What to do when I should know that these great scientists are in some cases not in truth?

Burnett: [8-01:48:40] Or not correct.

Černohorský: [8-01:48:42] Or not correct.

Burnett: [8-01:48:43] Yes, but that's a good teaching moment for them, for you to tell that story.

Černohorský: [8-01:48:56] Sorry?

Burnett: [8-01:48:56] It's a good teaching moment. It's a valuable lesson for the students.

Černohorský: [8-01:49:06] If they understand. It's not easy to bring somebody to such questions. First of all, if they are accustomed from the secondary schools to be taught in the regime of facts and not understanding.

Burnett: [8-01:49:44] Right, rote learning.

Černohorský: [8-01:49:46] Therefore, I explain to them that facts, of course, are the basis. But this is the first degree. The second degree is to understand facts, and the third, to be able to explain this understanding to other people.

Burnett: [8-01:50:17] Well, Dr. Černohorský, I would like to thank you on behalf of the people of the Czech Republic, the students of the Czech Republic, your friends and colleagues, such as Tony Placzek, for example, for teaching people carefully about science and about justice and about how to live well in the world. All those people appreciate that, and I thank you for taking the time to speak with me.

Černohorský: Many thanks indeed for these words.

Martin Černohorský: Science, Reason, and Passion in the Struggle for Freedom

Part II: The Student Interviews

Jiří Grygar
Jiří Komrska
Ludvík Kunz
Marie Fojtíková



Left to right: Jiří Komrska, Ludvík Kunz, Marie Fojtíková, Martin Černohorský. Brno, 2019
Jiří Grygar was interviewed separately in Prague.

The following interviews are with individuals who developed lifelong relationships with Martin Černohorský. Jiří Grygar, Jiří Komrský, Ludvík Kunz and Marie Fojtíková were his students at what is today known as Masaryk University. Over the years, they mostly came to know him as a colleague through their work in the Czechoslovak Academy of Sciences. An important part of this larger story is that Martin Černohorský, because he refused to join the Communist Party of Czechoslovakia, was not allowed to become a professor, an exclusion which was rectified after the transition to democracy. Although the details of each specific encounter will be explored in the following interviews, what is most important to note is that he entered their lives as a mentor in the fullest sense of the word. Today, in our academic fashion, we often talk about focusing on the whole student: teachers should provide stable guidance, not only through instruction, but also through life. It is something that we talk about, that we declare must happen, but rarely do we make, as individuals or as educational institutions, the sacrifices needed to support and shape the lives of young people.

In these interviews, these students, in this larger sense of the word, explain what Martin Černohorský represented in their lives. Although they studied science with him, they learned a much more comprehensive lesson: a way of being in the world. They were not just scientists; they were also citizens of a complex society that had experienced and continued to suffer tremendous difficulties, and injustice. These “whole students” wrestled with these challenges, sought guidance from their teacher, and worked with him to make Czechoslovakia and later the Czech Republic a better and more just place in which to live. They became champions of science, shepherds of democracy, and devotees of justice and freedom, with a strong sense of duty to an evolving nation. They each became leaders in their fields of work, in spite of the fact that many of them chose to sacrifice career opportunities in order to satisfy their own moral sense, cultivated in no small way by their mentor, Martin Černohorský.



Dr. Jiří Grygar, after a performance in honor of his 80th birthday in Prague, 2016

Biography

Since 1991, Dr. Grygar has been a Senior Scientist in the Institute of Physics of the Academy of Sciences of the Czech Republic in Prague. After a career in astronomy and astrophysics with the Institute of Astronomy of the Czechoslovak Academy of Sciences that culminated in his directorship of the Observatory in Ondřejov, he began a second career in 1983 as an astrophysicist at the Institute of Physics in Řež, followed by a third career as one of Czechoslovakia's most beloved public figures, earning the Kalinga Prize from the United Nations (UNESCO) for the popularization of science in 1996.

Burnett: [00:00:00] This is Paul Burnett interviewing Dr. Jiří Grygar for the Martin Černohorský/ Czech Physics project, and it's May 21st, 2019 and this is our first session and we're here in the Czech Academy of Sciences. Welcome, Dr. Grygar.

Grygar: [00:00:36] Welcome here to Prague.

Burnett: [00:00:41] Yes. Thank you for that. By the skin of my teeth. It's customary to begin these types of interviews at the beginning. So if you could tell me a little bit about when you were born and where you grew up, a little bit about your family background as a context for what we are talking about?

Grygar: [00:01:02] I was born abroad, not in Czechoslovakia, but in Germany because my father was a customs official. He was assigned for duty at the foreign Czechoslovakian customs office in Germany. It was very close, of course, to the Czechoslovakian border, about 150 meters only because it was the frontier railway station called Heinersdorf in German and Pruský Jindřichov in Czech. My father was a customs official for goods and merchandise. He graduated from the Business college in Opava, capital of the Silesian province of Czechoslovakia. He was fluent in German; therefore he was respected by his German colleagues. The whole arrangement of custom offices around German/Czechoslovakian border stems from the relic of the situation before the First World War. In that time, the same borderline was set between German Reich and the Austrian monarchy. All customs officials were speaking the same language and thus it was easy to build both customs offices in single buildings along the borders. Both German and Austrian customs officials opened the wagon with goods travelling across the common border. Both customs inspectors checked the merchandise and signed the customs declaration together at single checkpoint. This arrangement was working well and saved time for both parties also after the 1st world war, when Austrian customs officials were replaced by Czechoslovakian personnel.

Grygar: [00:02:47] Until 1936 when I was born, the situation was quasi-normal. In Germany, Hitler was already in power, but the behavior of German officials was correct and the customs officials of both states cooperated normally. However, very early in May 1937 when I was 15 months old — I knew it from the later recollections of my parents — the situation suddenly worsened. The local citizens of the village — Heinersdorf was a small village at the border — started to attack my father because he wore Czechoslovakian uniform of customs official. Thus we had to flee Germany. It was not very difficult because it was so close to the borderline, but we had to flee because otherwise probably the local Nazi fanatics would have killed us, the whole family. We were a single Czech family in a German village. Incidentally, several Nazis crossed illegally the Czechoslovakian borders on September 22, 1938 and killed Czechoslovakian patrol officers in their garrison in Vidnava, a little Czechoslovakian town nearby Heinersdorf.

Burnett: [00:03:58] That was your first encounter with some of the chaos.

Grygar: [00:04:01] Yes, but of course, I didn't perceive the problem; I was utterly innocent baby. So we fled to Opava where my father was born in 1900, now the seat of the Silesian University. For a short time he served as a customs official in Opava railway station. However, in September 30, 1938 the Munich agreement was signed between four European powers – Germany, U. K., France and Italy. Czechoslovakian delegation was

denied participation in the negotiations; it was a dictate. Opava suddenly became the territory of Germany, so we had to flee again. During less than 1 and ½ years, we experienced two forced escapes. We moved to the big Czech industrial town Ostrava. Ostrava was suddenly located few kilometers from German borderline. My first strong memory of my life occurred on March 14, 1939. I woke up in the morning and I could not find my parents in their bedroom where slept also my baby sister [born March 8, 1939]. Finally I have discovered my parents both looking behind the curtain of the window in the living room to the street and weeping. On the opposite side of the road was a large building of a municipal school called “red school” because of the hollow red-brick façade. Strange soldiers mounted big vertical banners over the façade and very strange vehicles parked in front of the school. Our street was located in the very center of Ostrava directing to the City Hall. The German *Wehrmacht* decided to occupy the school and placed their Ostrava headquarters there. I was intuitively horrified by black swastika in the middle of the banner. And due to the behavior of my parents I realized that they felt helpless.

Burnett: [00:06:35] So they were afraid. And so as a young boy, *you* are afraid.

Grygar: [00:06:39] Yes, because normally the parents were always in a good mood and therefore I feel very safe. After the war I have learned the “agreement” of so-called *Protektorat* of Bohemia and Moravia was actually signed next day, March 15. Thus the *Wehrmacht* occupied Ostrava illegally. Ostrava had Czechoslovakian protective military barracks not in downtown Ostrava, but in nearby smaller town Frýdek-Místek. The *Wehrmacht* attacked the barracks also on March 14 but Czechoslovakian regiment opened fire and decimated the German troops. Historically, this was the only clash between the Czechoslovakian army and the *Wehrmacht*. Curiously, the soldiers of the Czech regiment were not persecuted. The *Wehrmacht* admitted that their soldiers made a mistake!

Burnett: [00:07:45] My goodness. I understand that they were concerned about the Czech army. Hitler was very afraid—

Grygar: [00:07:56] We had in that time a very dedicated army. And all Czech and Slovak people were very motivated at the time. Thus, I was by chance confronted with the turbulent history of Central Europe very early in my own life.

Burnett: [00:08:11] Yeah. And you witnessed history at a very young age, world history.

Grygar: [00:08:15] Well, I realized the consequences a bit later when I was about five years old.

Burnett: [00:08:18] Well, you witnessed the flag.

Grygar: [00:08:20] I was horrified by seeing the German banners. I still see it. It was a very, very long red flag and the in the center was a white circle and the swastika.

Burnett: [00:08:32] It’s difficult to forget that.

Grygar: [00:08:35] That’s the first experience.

Burnett: [00:08:37] And so, you were a child during the war.

Grygar: [00:08:41] Yes. I was nine years old at the end of the war.

Burnett: [00:09:02] And then, in '48 is the coup, communist coup, and I guess you are even, twelve at the time?

Grygar: [00:09:08] Twelve at that time. Before the real war my father was assigned the Customs Office in Brno, the capital of Moravia, the second largest city in *Protektorat*. There I spent the whole Second World War and I maintain continuously my memories from the age of about 5; the year 1941. Of course, I remember well our move from Ostrava to Brno, where my father was assigned as the customs official in Brno. Although my country was occupied it maintained regular customs policy with Germany and other allies of the Reich until the end of the war.

Burnett: [00:09:46] Yes, they needed documentation. [laughter]

Grygar: [00:09:47] Well, Germans are pig-headed bureaucrats. They love documents, official stamps and checkpoints. Before I started my school years we witnessed the assassination of German Deputy *Reichsprotector* Reinhard Heydrich by Czech and Slovak parachutists on May, 1942. Hitler was furious and the German Secret Police Gestapo and SS units were very brutal. The village Lidice near Prague was eradicated on June 10. Three hundred forty men, women and children in the village were killed, although they had absolutely no liaison with the assassination. The parachutists were finally revealed in their shelter in a Prague Orthodox Church where they opened fire and reserved the last bullets for themselves. Another little village Ležáky was eradicated in eastern Bohemia and 37 adults were shot and 11 children died in gas chambers. The mass killings of Czech people for the crime "Agreement with assassination of the *Reichsprotector*" advanced till the end of September. Thousands of Czech citizens were executed after brutal torture.

In this time when every day were posted black and red announcements about executions, I started my first year in school. In the elementary school I feel fine because all teaching was in the Czech language. But in the second grade of the school, we already had some part of our teaching in German. We had to learn German and, of course we hated to learn German. We were trying to be the worst pupils of an enemy language. But I must admit that our education was not too much spoiled by Germans. We had Czech teachers only and we had practically normal curriculum until the end of the war.

Burnett: [00:10:51] And there's a longer history of Germanization in the Czech lands. There were factories where they required the workers to speak German.

Grygar: [00:11:02] Yes, and there were streets named in the German language and so on.

Burnett: [00:11:08] Right. So this is now a very explicit domination and control.

Grygar: [00:11:11] Yes, because during the war, we had a special system of food and textile stamps, the German population of Brno had much higher rations than Czechs.

Burnett: [00:11:32] Which, of course, on top of everything else led to resentment, and after the war there were some problems.

Grygar: [00:11:40] And the main horrible experience in Brno — probably my colleagues already told you — was the student dormitory in Brno called Kaunicovy Koleje. *Kaunic* was a Czech nobleman who donated to university students big building. When the Masaryk university was closed, Kaunicovy Koleje were seized by the German war court that condemned Czech patriots to concentration camps or executions. The execution site was located on the open yard, so the executions could be spotted from nearby street. German citizens were coming to watch the performance online. They did not hide their happiness to see Czech citizens killed by the firing squad.

Burnett: [00:12:33] Yes. Public sadism.

Grygar: [00:12:36] Yes, public. And almost every day we have seen at all public places the announcements of who was executed the previous day very often the whole family, mother, father, children.

Burnett: [00:12:53] And wasn't there a case, there were some Czech partisans, two men, who attacked—?

Grygar: [00:13:00] Heydrich, yes. He died after some days after the attack.

Burnett: [00:13:01] Heydrich [governor of the *Protektorat* at the time], and the German army eradicated two villages and executed all men in Lidice and all people in Ležáky for approving the act.

Grygar: [00:13:04] Lidice was an arbitrary village near Prague, without any connection to the assassination. Nazi SS unit killed all men older than 14 and women and children were sent to concentration camps. Very few of women and their children survived. The village was completely eradicated. The second mass murders occurred some days later in Pardubice where the Nazis completely destroyed the village of Ležáky on June 24, 1942, and killed all of its inhabitants in retaliation for the assassination attempt. While in Lidice they killed only the men, in Ležáky — the second victim — they killed even the children and women. Also that village was eradicated.

Burnett: [00:13:37] So, it was obviously a period of brutality and trauma for the Czech people and for everyone who witnessed it and was involved.

Grygar: [00:13:47] Already more than a year ago I desperately wish to learn reading and writing. However my mother was a teacher, and she believed that children should not start learn reading and writing before entering the school. However, I discovered a method, how to overcome this ban. I was angry because I wished to learn read immediately, and I invented a trick before I was five. The city streets in Brno are crucial in a case. Only in Brno, not in other Czech cities, on every building is indicated not only a serial number of the house but below the number also full name of the street. When I was four, my parents told me that I have to know our address, so if I got lost, I could explain to anybody to what place I have to be returned. First of all I realized the meaning of numerals; this is rather easy – just 10 characters only. Slightly more complicated were, of course, letters. However, Czech written language is phonetic but complicated due to

diacritical marks – commas and hooks. For every sound we have a single letter. First I decipher the name of our street and got also the phonetic principle. I realized that for every sound I have to find only one letter, contrary to English language, for instance.

Burnett: [00:15:22] I apologize. [laughs]

Grygar: [00:15:25] Yes, you know. So, when we were visiting our relatives, I asked what is the name of the street of our relatives. So they told me that. Okay. I just looked at the table, and within a fortnight, I learned the whole alphabet.

Burnett: [00:15:46] Just by the desire to learn.

Grygar: [00:15:48] Exactly. I had a very strong desire to learn read and write in order to be independent before the school.

Burnett: [00:15:56] Was this a pattern? Is this a pattern in your life?

Grygar: [00:16:02] Well, looking backwards I see that this is definitively my pattern. The second story was even more eccentric. Our parents of were accustomed listening to foreign radio, especially London. It was a typical daily regime, they listen to BBC London that had relays every day in Czech language about the real situation in the world and in Czechoslovakia. In that time all information in our country was censored. When my sister and I went to our baby room for sleep, they leave the doors open between our room and their bedroom. In their bedroom, they had the radio set. They put the blanket over themselves and the radio—because it was very dangerous to listen to the foreign radio programs—and they listened to the evening news. And once I was playing in the kitchen in the day, and I was just hidden under the table. I had, how would you call in English—it is made from wood and used like a spoon - wooden spoon. I had also took away a pot from the cupboard. Suddenly I started to beat on the inverted pot with the spoon and said: Pa-pa-pa-bum [singing a radio call sign] “London is calling. You are listening to the Czech language broadcasting from BBC.”

Burnett: [00:18:15] You imitated the announcer [of the BBC World Service].

Grygar: [00:18:17] My mother was completely shocked and she said, you know, you need not tell about —.” I replied, “Don’t worry. I know because I already have read on the radio set a warning that listening to the foreign radio is punishable by prison or by execution.”

Burnett: [00:18:44] By death. And it’s written on the radio. And you read that?

Grygar: [00:18:46] I read the warning before. Since that incident I was allowed at the age of five to listen to the foreign radio station with my parents the evening news and commentaries from Great Britain until the end of the war. So I was very early a political bird.

Burnett: [00:19:09] Do you think that that the crisis, accelerated your desire to learn? You felt it was a survival instinct?

Grygar: [00:19:15] Yes. I was practically another person by the end of the war.

Burnett: [00:19:22] That was probably true of many people.

Grygar: [00:19:24] Very probably.

Burnett: [00:19:29] And so the war ends with much dislocation. There was the repatriation of German-speaking peoples, and the Russians arrive, and so there's more chaos to come after the war as well.

Grygar: [00:19:48] Yes. So in 1945, when repatriations started of millions of German people who were transferred from Czechoslovakia to Germany. Simultaneously Germans were transferred to the West from Prussia and Polish people arrived there from Eastern Poland that was seized by the Soviet Union. We had a relatively independent country for three years, from 1945 until 1948, until the communist coup. Brno was liberated at the end of April, 1945, and the war in Europe ended on 8th of May. Only some years ago I have learned that already on 15th May to Brno and other Czech and Slovak cities arrived the officers of the Soviet secret police, and they identify people who were former Russian citizens, who escaped from communism to Czechoslovakia before the Second World War and became Czechoslovak citizens.

[00:20:52] These criminals had the exact addresses of poor victims. I do not understand how they got them. They located almost all people of the Russian and Ukrainian minority. They illegally kidnapped them from Czechoslovakia first to Budapest and then from Budapest with special trains that went through all countries of Eastern Europe to Siberia. These victims were abducted to Soviet gulags. Many thousands of people — some died during the transports, some were immediately shot upon the arrival to the camps and most of them were exploited by forced labor under cruel conditions, became ill and died later on. Very few of them survived.

Burnett: [00:21:29] They disappeared.

Grygar: [00:21:31] Yes. And the Czech government did nothing about it.

Burnett: [00:21:34] So, there are these massive dislocations and traumas, but, anyone who's in that situation has to survive. And your family had to survive.

Grygar: [00:21:49] Yes.

Burnett: [00:21:50] And you continued, I imagine, in some type of normal state?

Grygar: [00:21:54] Immediately after the end of war my father was assigned to Opava again to restore Czechoslovakian customs office there. Opava was a rather big city. Have you been there, no? The present population of Opava is over 56,000.

Burnett: [00:22:20] A steel town, isn't it?

Grygar: [00:22:21] No, that's Ostrava. The bigger city Ostrava is rather close to Opava. Opava is now located very close to Polish, not German borders. All German citizens who in 1937 and 1938 forced our Czech family to leave, at first from the railway customs station in May 1937 and from Opava in October 1938, were transferred in 1945 to West

Germany. My birth village has belonged since the end of war to Poland. In my official documents [driver's license; passport] Poland is indicated as my birthplace!

Burnett: [00:22:59] It's just emblematic of the kinds of changes and dislocations that happened. You're not even a teenager at this time?

Grygar: [00:23:08] I was nine at the end of the war. In 1939 my father was assigned to the customs office in Brno, the capital of Moravian province. Thus until the end of war we lived in Brno, the second largest city of Czechoslovakia.

Burnett: [00:23:11] So you're now you're relocated to there and was there some stability there in Opava?

Grygar: [00:23:19] No, the problem with Opava after the war stems from the last large battle between Wehrmacht and the Red Army in March-April 1945. Industrial city of Ostrava was surrounded by the Red Army. Opava was almost completely destroyed by fierce artillery and air bombing. The Soviet Army tried to save Ostrava because of steel factories and coal mines. To the purpose the Red Army besieged Ostrava and Opava was sacrificed instead. At the end of war Opava was the most damaged town in the whole Czechoslovakia. My father was assigned to restore the customs office in Opava already in June 1945. He had to live in his customs office room in the railway station because the railway station building was repaired soon. My mother and we children joined father on November 1945 when daddy found an apartment house that was suitable for living. When we arrived in Opava, there was no public illumination there. We had to go from the railway station in total darkness through ruins to this single house that was miraculously intact.

Burnett: [00:24:37] And so, you spend that period then through the, so there's the coup and '48. And, you are attending middle school?

Grygar: [00:24:51] In Opava, I finished my closing fifth year in elementary school. I finished this school in 1946. Just before the end of May 1946 we had the first free elections after the war. Until that time in '46 we had a provisional government and provisional prime minister. We had free elections, but actually not very "free." Just four political parties were allowed to be eligible. Practically all four parties were socialists, so no right-wing or centrist parties were permitted. I was shocked that Communist got 40% of votes. When the result of this election was announced in the evening radio news, I got a fever. I was astonished that the communists were the victors, because I knew already from their behavior since 1945 that they are liars and terrorists. I don't know how I learned it, but I knew it definitely.

Burnett: [00:26:07] Were you reading the newspaper?

Grygar: [00:26:09] Yes. Yes, very much. I read a lot of newspapers. And of course I lived in family of very active democrats, i.e., my father and my mother. Both of them were educated in Masaryk's republic in between the World Wars I and II. In that period Czechoslovakia was one of the most advanced democracies in Europe.

Burnett: [00:26:32] Right, the Interwar period.

Grygar: [00:26:34] Yeah. So, so we had this education from our parents.

Burnett: [00:26:38] Right. Can you talk to me a little bit about the beginnings of your interest in—I can sense it as an interest in learning, in developing tools to learn but an interest in the natural world, in science, did that appear then or was it later?

Grygar: [00:27:03] Yeah, my desire for learning appeared already during the war and particularly before the end of the war. I was quite happy to be alone. I was not interested in toys. I was interested in books. This was the reason why I desperately try to learn reading before school. My parents understood soon that I love books for teenagers. As gifts for birthdays, or Christmas I always wanted books. Specifically, not for young children; I preferred the books that are now called as popularization of science. This was much more attractive to me than other children's books. Almost always when I read "my" book, I told the parents that I would be interested in that particular subject, but I always changed my mind after reading the next book.

[00:28:15] But at Christmas time in 1944 when Brno was very heavily bombarded by the Americans—Americans or British—because we had war factories in Brno. So it was a very, very difficult time because you could easily be a victim of these bombardments. We had the main factory for rifles and machine guns about one kilometer from our house. And in that time, the accuracy of the bombing was very poor. At Christmas 1944 I got a book about the starry universe called *The Universe with New Eyes*. The subtitle says it is written for the youth. And I was the eight-year-plus-old youth, so it was just for me.

Burnett: [00:29:31] Yeah. [laughter] It was supposed to be for a teenager.

Grygar: [00:29:35] Yes.

Burnett: [00:29:37] Yes, yes. Precocious.

Grygar: [00:29:38] So I started immediately read that book. It was rather thin, so I read it on Christmas Eve after I got it as a gift. I did not go to sleep before I read the whole book, and before the New Year, I knew it by heart, the whole book, and I told my parents that I shall become an astronomer.

Burnett: [00:30:12] Just like that, at age of eight.

Grygar: [00:30:15] Yes. At 8+.

Burnett: [00:30:15] So you had already, you said every two weeks you would change your—

Grygar: [00:30:20] My parents would laugh of course, because they knew that after a fortnight I shall switch to another subject. No. I took it seriously. I just proclaimed that I shall be an astronomer and I tried to find out how to do it because my parents didn't know and other relatives also have no advice. However, after some time I realized that, that an astronomer should study physics and mathematics. Thus I started studying privately, just by myself. I asked my parents to buy for me the textbooks of physics and mathematics, and I studied it.

Burnett: [00:31:07] My goodness. So you had already developed the tools to learn and to devour knowledge. You were, you were obsessed a little bit about this.

Grygar: [00:31:16] Yes.

Burnett: [00:31:17] And it's interesting. If you had said, I read fantasy novels you could understand, "Oh, this was a need to escape the chaos of your surroundings." But instead you chose, you wanted *more* reality, a more profound reality.

Grygar: [00:31:37] Yes. I wasn't interested in science fiction, not at all, because I knew that it is not true. It's just some fantasy. And I knew that the astronomers are doing a very, very good job. They already knew a lot of things that were for me very strange because, you know, in all the other sciences you can touch the subject, you can touch the animals and people, chemical molecules, you can touch physics objects, you can touch the geology rock and minerals. These things are here. But astronomy is far away. And in that time, nobody believed that we would be able to send some rockets to space. So I was really admiring my predecessors; they were able just from a very great distance to learn so much about the universe. So this was my main argument. And I realize that this is an ultimate challenge for me. I have to go and proceed in that way.

Burnett: [00:32:45] So you then continue. Did you do middle school?

Grygar: [00:32:49] Yes, I did. And I started the grammar school in Opava, but after only one year new school reform was decreed by the communist government. First four years of grammar schools were abolished. Four years of middle schools were compulsory for all pupils. By the way, while grammar schools were coeducational for boys and girls, middle schools were separated for them. Incidentally, the same scheme I experienced during the elementary schools during the war years. Number of pupils in Opava in the beginning of November 1945 was relatively small because many Opava residents have the same problem like my father to find an undamaged house. So in the end of 1945, we had in our class about twenty pupils only, boys and girls, while during the war were boys and girls educated separately. When I started my elementary school in 1942, the whole school was boys-only. My younger sister attended another school, girls-only. Thus we boys saw girls for the first time in our 4th class of the elementary school in Opava during the school year 1945-46 but the girls had again separate class in the year 1946-47.

Burnett: [00:34:33] Yes, another education.

Grygar: [00:34:34] Another education, but it was only for one year, because when all the people returned to Opava the schoolteachers again separated girls and boys, and so the fifth grade of elementary school, I was only among boys, but a year after at the grammar school we had again girls.

Burnett: [00:34:58] How long did you stay in Opava?

Grygar: [00:35:00] I stayed in Opava until 1949. The problem was that in 1946 my father died unexpectedly after a gallbladder surgery. I was ten when he died. We lost practically all income because he was rather young [46], therefore his pension was small. Moreover, there was another problem, because in Czechoslovakia before the war, if a woman who was teaching in state enterprise got married to a state official husband she

was denied to be employed any more by the state. Our mother was a teacher of Czech language and exercise. Thus until the death of her husband she was unemployed since their marriage in the year 1932.

Burnett: [00:36:30] So she returned to teaching?

Grygar: [00:36:31] No, it was difficult after a long pause and moreover the teachers were under a pressure to proclaim communist ideology that was definitely opposite against her life stance. We had one advantage that my mother had an older widowed sister that was chronically ill. She had a severe heart disease. She lived in Brno and she suggested to my mother that if she came to Brno, we can stay in her house without paying rent. This was a blessing for us, my mother helped her sister with cleaning of the house and cooking. Thus around Christmas 1949 we returned again to Brno. Our mother found a part-time laboratory job in the Research Institute for Nutrition.

Burnett: [00:38:12] So when she was a teacher before, was she teaching—

Grygar: [00:38:18] In the schools.

Burnett: [00:38:19] At an elementary?

Grygar: [00:38:20] She was teaching Czech language and gymnastics in middle schools.

Burnett: [00:38:28] Okay. So she was able to reintegrate into the workforce.

Grygar: [00:38:37] Yes.

Burnett: [00:38:31] She was still young, and fortunately, amongst all of this tragedy, you are in Brno, which is the center of science and industry, and the schools are excellent.

Grygar: [00:38:47] That was the advantage. There were many fortunes in my life. For instance in Opava in the fifth grade of elementary school joined our class a boy and I asked him what are his hobbies. He said he is interested in astronomy. So we immediately made a couple. Moreover our homes were very close, just a street apart. Every school day we walked back home together discussing astronomy. At the crossroad to our homes we discussed astronomy for hours until one of the mothers localized us and dissolved the discussion. [Burnett laughter] And we mostly always talked about astronomy.

Grygar: [00:40:13] Then we realized that in an information desk near our homes appeared an announcement, that an astronomy club for adults started meetings every week in very center of the town. We were ten years old and we just applied for membership and the chairman [a teacher] accepted our membership.

Burnett: [00:40:36] Wow, that's fantastic!

Grygar: [00:40:38] This was another fortune.

Burnett: [00:40:42] So it did not stop you that society said you are too young or “You’re not the right age.” You said, “No, I want to study this.” And people responded, “Okay!”

Grygar: [00:40:58] Yes. And when I moved to Brno, I of course lost my astronomy fellow who lived in Opava until finishing the grammar school. After that he studied geology. And he did not become an astronomer; he studied geology, next he lectured at the Geology Faculty and did research about brown coal supplies. My own target did not change. I had finished the middle school in Brno and applied for the higher-class grammar school in 1951. Soon I realized that we had teachers who were former lecturers at Masaryk University, but after the communist coup were expelled from the University and demoted to lower positions at grammar schools. Thus we had excellent teaching in science but also in languages and even sociology. Another good fortune.

Grygar: [00:41:57] One teacher was degraded from the position of school inspector to my middle school. He was excellent teacher of chemistry and biology. And once after a lesson, he called me and asked if it is true that I was interested in astronomy. I confirmed that he is right. Then he told me that his son is interested in astronomy. Perhaps, I would be interested in meeting him? Because his son was one-year older than me, we did not meet in the school, but through his father.

Burnett: [00:42:27] So you had more contacts, the social contacts.

Grygar: [00:42:30] Moreover, I knew the surname of the son, because he already published his observations of sunspots in the Czechoslovakian astronomical monthly bulletin. Another piece of good fortune.

Burnett: [00:42:39] Really?

Grygar: [00:42:39] Yes, in a Czechoslovakian bulletin [*Říše hvězd*], which means “The Realm of the Stars.” We met with Luboš Kohoutek immediately and for the first time in my life I saw a real astronomical telescope.

Burnett: [00:43:13] Oh my goodness. So that’s an early exposure. And you’re only — this is ‘49 that you’re, so you’re just 13 years old.

Grygar: [00:43:24] I was 14, when after many discussions with Luboš we initiated more sophisticated observational programme in astronomy, namely collective visual observation of meteor showers. We bought a Czech booklet, “Instructions for Astronomy Amateurs,” and there were several possibilities how to organize the observations without telescopes, just with our eyes. In August 1953 we observed with Luboš meteor shower Perseids. Luboš lived in a rather high apartment house [six floors and a flat roof]. He borrowed a key to the flat roof and from that place near a big park we started rather successful observations. Immediately after that we analyzed the data and published them in Reports of Brno Observatory.

Burnett: [00:44:40] You did?

Grygar: [00:44:40] We both with Luboš knew well that in Masaryk University in the Faculty of Science was an active astronomical department that sometimes organized public lectures for amateur astronomers. So we visited all such lectures. We discovered that the Department of Astronomical Institute bought electro-mechanical computer performing simple arithmetic calculations [addition, subtraction, multiplications and division]. For analyzing our meteor data we need to calculate many long albeit boring

arithmetic operations. We have asked the leader of the Department whether we could use the computer after office hours of the Department and Dr. Luboš Perek [1919-2020] lent us the key of the Department. Thus between 6 to 10 pm we ran the noisy computer several times every week.

Burnett: [00:45:51] My goodness.

Grygar: [00:45:52] And Luboš was sixteen; I was fifteen. Thus during the years of grammar school, we have already published papers about the observation of meteor showers. Another fortune.

Burnett: [00:46:04] So at this time, it's obvious that you're going to attend university. And were you able then to start early? Were you able to skip a grade?

Grygar: [00:46:17] No, no, no. This was impossible. At the time it was already a rigid communism, exceptions were abolished. So we had to go normally to school and graduate from the shortened (upper half) four years grammar school. However, in 1952 another school reform shortened the curriculum to three years only. Luboš had to study the last school year during July-August 1953 and graduated the first week of September. Our class graduated in 1954 after 12 years of school studies, but the official names of the schools sounds Eleventh-Year Schools!

Grygar: [00:46:55] After graduation I have entered the study of physics at the Faculty of Science at Brno Masaryk University. Luboš was already in the second grade. First five semesters were reserved for basic physics studies, but it was allowed to subscribe also the eligible lectures. Of course, I have subscribed to all three optional astronomy lectures. I have already mentioned the name Luboš Perek, Associate Professor in that time. It was immediately apparent that he is also an excellent teacher.

Burnett: [00:48:14] That's inspiring. So, you had three years at Masaryk University?

Grygar: [00:48:22] Not quite. Only five semesters. And then Perek, who was the director of the Astronomy Department in Brno moved in 1956 to the Astronomical Institute of the Czechoslovakian Academy of Sciences in Prague. And, because he was the only professor in Brno, Brno lost the possibility to grant degrees in astronomy. That department exists but only for research, no teaching.

Burnett: [00:48:50] So there was a real shortage— Others have talked about the shortage of professors and teachers.

Grygar: [00:48:56] Yes, obviously, because, during the war, all teachers were at home or killed, and, practically, from 1939, the universities in the Czech *Protektorat* were completely closed. For 6 years, all Czech universities were closed for teaching and research.

Burnett: [00:49:17] And there's a reconstruction of the Czech university system, I understand, kind of according to the Soviet model, is that right? Even the designations of the degrees—

Grygar: [00:49:32] Yes, the designations were completely crazy. A major problem for us was the loss of astronomy accreditation in Brno. For me, it was very difficult because I had very little money, so going to Prague was difficult and a place in the university dormitory was uncertain. Luboš Kohoutek was in a better position because his father and mother were alive and can support him. Moreover just in time when I have to pass last exam before moving from Brno to Prague my mother died. I had to organize the funeral, pass legal procedures during which I was moreover assigned as a guardian for my sister that was 17 years old.

Burnett: [00:50:22] You were now the guardian of your little sister.

Grygar: [00:50:24] Yes.

Burnett: [00:50:25] How much younger was she?

Grygar: [00:50:27] She was three years younger. Adulthood started at 18.

Burnett: [00:50:36] So you had to, you were already growing up and now you were definitely an adult—

Grygar: [00:50:43] Yes.

Burnett: [00:50:45] —as a kind of quasi-parent. So you had to make your choices carefully, and you have to think about money. What were your options then?

Grygar: [00:50:56] I absolved myself of another impossible mission. However, since my 18th birthday I started to deliver public lectures of astronomy for the general public. In all communist countries there was great pressure to popularize science because the communists thought that if scientists popularize science, people would not go to church. Popularization of astronomy was supported as an example of contradiction between science and faith. Curiously, I was very free to explain in my public lectures that there is no problem between astronomy and faith. However, there exists very strong contradiction between astronomy and astrology.

Burnett: [00:51:41] [laughter] It's your church.

Grygar: [00:51:43] For these lectures organized in culture houses or even pubs in villages I was paid by the Society for Dissemination of Political and Scientific Knowledge. Rather often I travelled to some inns around Brno, and there I lectured to ten to twenty interested people. The fees for these lectures were low but they were an essential rescue for me. Another fortune.

Burnett: [00:52:07] Right. You were able to survive and you were able to feed your sister.

Grygar: [00:52:12] I had to be very careful with money. Yes. But I wasn't able to have public lectures in Prague. I lived in a university dormitory, that fortunately was cheap in that time. I had dinner and practically all three meals per day, each for two crowns sixty, so it was possible to survive. And the funny thing when I was living in the student dormitory, was that at the end of every month, my colleagues, who were living in various

cities in Czechoslovakia, had a shortage of money in spite of the fact that they have both parents. They asked me for loans.

Burnett: [00:53:09] Oh my goodness. I hope you charged them a good rate. [laughter] This is in '57, right? So you would go to a Karlova [Charles] University. Now in '59, do you do a thesis during this period?

Grygar: [00:53:30] Yes. In that time the first thesis had to be normally defended after five to six years of studies [I believe it was more or less the equivalent of a Master's Degree]. But, for instance, if you have a reader of basic course of physics like Černohorský, then the successful students could be easily granted a Bc. [Bachelor's] degree in Western universities. The Bc. degree is now normal part of curriculum in all Czech and Slovak universities. In our times we had to pass also the exams of Dialectical Materialism.

Burnett: [00:54:36] Yes. Yes. And you had to do well in that.

Grygar: [00:54:39] Yes.

Burnett: [00:54:41] Some people found out you can't just be a good scientist; you also had to be a good Marxist.

Grygar: [00:54:48] So in Prague the situation was very, very funny because we were just three students of astronomy in the Department. Therefore the professors and lecturers decided we had to be taught together. Because Luboš Kohoutek was older than us, in principle, he should have another course, but they put us together because we were just three sitting in one room, and there listen the lectures. The quality of Prague astronomy lectures were very poor in contrast with the good level we had in Brno. I was taught by Martin Černohorský in modern physics, and he was really demanding teacher.

Burnett: [00:55:36] He was demanding?

Grygar: [00:55:37] He was very demanding, very accurate and very concise but kind. This is why we liked him very much. I realize that his basic physics course was essential for my work in science until now. True iron base for the whole life. Therefore I was shocked how poor (with very few exceptions) were the lectures at astronomy department at Charles University in that time.

Burnett: [00:55:52] Okay. It was not useful to you, and you didn't feel that you were advancing?

Grygar: [00:55:54] So I practically learned almost all astronomy from conversations with Luboš Kohoutek and Zdeněk Sekanina. We three colleagues were just mutually teaching ourselves.

Burnett: [00:56:16] And teaching each other is the science that you needed to do astronomy.

Grygar: [00:56:24] One story I wish to tell you. We had a reader, an Associate Professor, and he was already rather an old man. I think he was about 68 and he was teaching us the

astrophysics of stars, and he did it according to a textbook written by Swiss physicist Robert Emden who published the book called *Gaskugeln* in 1907. *Gaskugeln* means “gaseous spheres” and “gaseous spheres” was the name for the stars in that time because astronomers in the year 1907 were not certain whether stars are gaseous or liquid.

Grygar: [00:57:26] And at the end of this course, which lasted for two semesters, he said, “You know, gentlemen, I would like to teach you more, because I have noticed that in England Professor Arthur Eddington wrote a new textbook about the structure of stars, but I have not yet been able to read all the contents of this magnificent textbook. [Eddington published this book in 1926]

Burnett: [00:58:01] So you felt right up to date. [laughter]

Grygar: [00:58:01] Yes.

Burnett: [00:58:05] So that’s just an example of what you were dealing with and you had to find information yourself, *again*.

Grygar: [00:58:13] Well, we three were almost autodidacts in astronomy.

Burnett: [00:58:14] So this was a pattern that you just, wherever you were going, well, you can understand, I suppose that post-World War Two, inside the Soviet orbit, there was room for physics, but the emphasis would be on weapons and that kind of thing, I suppose.

Grygar: [00:58:36] The main problem was the real science behind Iron Curtain, because we could not get practically any printed materials from the West. We were isolated to travel abroad. My first visit to a foreign country was to the Soviet Union. And even travelling to other countries of the Soviet Bloc was limited.

Burnett: [00:58:54] When did you go?

Grygar: [00:58:56] It was during our studies in Prague because, with Luboš Kohoutek in that time, we published a paper, and we won with it the contest for university students of all Czechoslovakian universities. Because of that we were awarded a paid trip to the Soviet Union. The trip was very adventurous. Soviet Union organized for the first time the 6th World Festival of Youth and Students that was held in Moscow and Leningrad in 1957. We travelled there in a long train with about five hundred young Czechs and Slovaks, most of them were laborers, peasants and sportsmen that were successful in factories, agriculture cooperatives and sports. Our first stop was in Lvov, the whole day we spent in Kiev, capitol of Ukraine and two weeks in Moscow and Leningrad. We met a lot of people and we realized that we are in much better living conditions than all the Russian and Ukrainian people. And we did not know in that time about the terrible things that started in Ukraine [The forced famine of the 1930s] and about gulags, the transfer of whole national minorities to uninhabitable places, and all other horrors of Soviet communism.

Burnett: [01:00:18] Right. And, I suppose in that period, too, there’s just a reconstruction and the Soviet Union was drawing resources from other countries.

Grygar: [01:00:26] These East-bloc countries, yes.

Burnett: [01:00:28] So you were relatively better off, but also experiencing shortages because so many resources were passing to the Soviet Union.

Grygar: [01:00:37] Exactly.

Burnett: [01:00:38] Okay. That helps. But there is a passion in the Soviet Union for science. It's a scientific quote, quote, "scientific ideology," and one year later is Sputnik, right? And so there's this sense that the Soviet Union is on the top of the world and you're inside that orbit. So, so there's a lot of support for—at least in terms of ideology—

Grygar: [01:01:09] Yes.

Burnett: [01:01:11] For the pursuit of scientific knowledge. So how did you make the next step if you did not have the—not the resources, because you were teaching yourself—but you needed the sanction—

Grygar: [01:01:29] Yes.

Burnett: [01:01:30] You needed the credentialing that would say you can now have a position somewhere. Were you concerned about that? How did you manage to make the next step?

Grygar: [01:01:38] So it was quite a turning point, to see how, on one side, the Soviet Union launched the Sputnik and they had the hydrogen bomb. Their first hydrogen bomb was detonated in almost the same time with the United States bomb. Soviets apparently gave all privileges to support a strong military army. Probably you know that these scientists and engineers who invented Soviet atomic bomb were actually in prison. They were prisoners. And if they were not successful, they would be executed.

Grygar: [01:02:24] The main experience from attending the Youth Festival was clear. Although we are deprived freedom, if we proceed under Soviet custody longer, we shall lose also the living standard. Our visit was really a very valuable experience. We both were relatively lucky. Luboš Kohoutek, who graduated one year earlier got the position in the Academy of Sciences and under the supervision of Luboš Perek. I myself was also successful, because just in the year 1959 when I finished my university studies I defended my diploma thesis easily.

So, I got the diploma *cum laude*, and for the diploma *cum laude* you had some advantages. So I could go immediately to studies for "PhD"—we had this candidate of science [*Candidatus scientiarum*] because it was the Soviet system of university degrees. Moreover, I had another stroke of luck, because, in that time when I graduated this master's studies, the Czechoslovakian government decided to buy from East Germany, the large telescope with the two-meter diameter of the primary mirror. And in that time there we only six larger telescopes in the whole world. Another piece of good luck.

Burnett: [01:04:14] What year was that? Do you remember? What year was this plan to purchase that telescope?

Grygar: [01:04:26] The government decision was done also in the year 1959. Just in time when I finished my university studies. This was the dream that I would like to have happen. So I immediately tried to get a position in the group that would in the future operate this telescope. I studied for the next degree [CSc.] which was an analog of “PhD,” and I defended my CSc. Theses in September 1963 in time when the building of the telescope dome in Ondřejov started and the Zeiss telescope 2-metre mirror was cast. I was a CSc. student until 1962, but I defended my PhD thesis a year later because the approval of the defense was very complicated administrative process including the evaluation of the candidate by the secretariat of communist party of the Academy of Science, although I never was a member of this organization. In the year 1963, a Czech building company began the construction of the dome for the Zeiss telescope, and in 1964 the whole dome was ready for installation.

Burnett: [01:05:33] So the telescope is earlier than I had thought.

Grygar: [01:05:38] No. Only after a mirror was successfully cast at Zeiss Jena [East Germany] the company started to build the whole mount. The moving parts of the telescope have the weight of about 83 tons. The mount and mirror arrived to Ondřejov in fall of 1966 and the final installation lasted until August 1967.

Burnett: [01:05:41] Okay. It took, it’s a long process.

Grygar: [01:05:43] The building of such a large telescope is a long process. You cannot do it quickly because you have to wait for the mirror to be cast and polished. Before polishing the glass should be heated to very high temperature and then it should be cooled very slowly for many months, because otherwise the precious shape of the mirror surface would be destroyed. So it’s a long process.

Burnett: [01:06:15] So it was a Czech team?

Grygar: [01:06:16] No. It was a German team in Eastern Germany, the famous optical firm Carl Zeiss Jena.

Burnett: [01:06:26] Right. But it’s a massive, incredible feat of engineering to make this happen.

Grygar: [01:06:33]. Yes.

Burnett: [01:06:35] And so you knew you wanted to be in on the ground floor, as we say, of this operation.

Grygar: [01:06:39] Yes, I had the advantage — I participated in the construction reviews, and so I knew the telescope very well, so it was a very good experience actually.

Burnett: [01:06:52] So you join then the Astronomical—

Grygar: [01:06:56] Astronomical Institute of the Academy of Science.

Burnett: [01:06:59] And it’s a four-year period where getting ready for this telescope

Grygar: [01:07:04] Yes.

Burnett: [01:07:05] Is everything focused around that, or are you doing multiple other projects?

Grygar: [01:07:10] No, I had to really concentrate on that. It is true that I did some other works, but I had to concentrate on the task how to use this wonderful machine.

Burnett: [01:07:20] Okay. So this is your opportunity to really do what you had really wanted to do, directly.

Grygar: [01:07:30] Correct. Exactly. I was very much surprised. Yes.

Burnett: [01:07:36] And it is in Ondřejov?

Grygar: [01:07:40] Ondřejov.

Burnett: [01:07:42] And is that an older observatory? Are there older telescopes there?

Grygar: [01:07:48] The story is very long, because it starts at the end of the 19th century. In Ondřejov lived a singer, a soprano of the National Theater of Prague. She was a countess and rather rich. She sung principal female role in the famous opera written by Bedřich Smetana called *The Bartered Bride*. She sung the role in the world premiere of this opera. She lived in a villa called Leonora, and had contacts with people from the astronomical community in Prague. This group of people in Prague was also very keen on music. They played the violin and piano. Sometimes the little group visited Ondřejov and play with her classic music there. And then, independently, there were two young engineers, brothers Frič, who were born in Paris. Why Paris? Their father was a fighter on the barricades in 1848 in Prague against the Austrian monarchy. And he was arrested for a crime—I don't know how to say it—

Burnett: [01:09:59] Treason?

Grygar: [01:10:01] Yes, he was sent for treason to the exile in Paris. [laughs] That's a very, very cruel penalty, of course!

Burnett: [01:10:07] Yes. That's terrible. [laughter]

Grygar: [01:10:11] Yes, terrible Austrians. Both future engineers were born in Paris, and in Prague lived the famous Czech journalist, poet and writer Jan Neruda. He has written a small, piece of poetry called *Cosmic Songs*.

Burnett: [01:10:52] *Cosmic Songs*.

Grygar: [01:10:53] Okay. Jan Neruda [1834-1891], who was a close friend of their criminal father Frič, went twice to Paris when these two boys were born, to serve as a godfather at their christening.

Burnett: [01:11:19] —christening?

Grygar: [01:11:19] Yes; Frič became the godfather of both sons. And he took these godfather duties very seriously. When the whole family Frič was after some years allowed to return to Prague, he taught these two future engineers astronomy. Before Neruda wrote *Cosmic Songs*, he subscribed himself as a private student of astronomy at the Charles University. So he knew the subject well and in the songs, he dealt with real astronomy knowledge; it's real science and many of his predictive verses were confirmed by astronomical discoveries during the 20th century.

Burnett: [01:12:06] These are so many— there's a long history of astronomy in this part of the world.

Grygar: [01:12:10] Yes, in this part of the world, because we had Tycho Brahe buried in Prague, and we had Johannes Kepler in Prague where he executed his main astronomical work. Absolutely the best theoretician and the best observer of that time were connected to Prague. We had also Einstein in Prague. His first professor position was in Prague, at Charles University in the years 1911-1912.

Burnett: [01:12:25] Right.

Grygar: [01:12:25] Why not?

Burnett: [01:12:26] Why not. So, not to change the subject to too much—let's certainly come back to talking about developing results—one of the things that's happening is a greater liberalization and reform in the 1960s. I'm wondering if you can talk a little bit about what you witnessed and what the effects were on the kind of the science around you that was being done and the consequences of the Normalization afterwards.

Grygar: [01:13:04] Yes. I think it started exactly in the year when I defended my thesis, because in that time, suddenly we had some foreigners from the West who came to Ondřejov. And I remember Professor Jorge Sahade [1915-2012], who was an Argentinian astronomer and who came to us and he was a very influential scientist and my older friend, because later on he was elected the President of the International Astronomical Union. He arrived to Ondřejov because the scientists in the West apparently knew in which difficult situation we were, and some of them, relatively many of them, thought of how to help Czechoslovakian astronomers.

They arrived because they knew that we could not go out to the West, while they were allowed to come and pay for the visa in foreign currency to our national budget. So this was the new deal. And, for me, it was even more important that in the same year a Canadian astronomer named Anne Underhill [1920-2003] came to Ondřejov. She was a professor at the University of Utrecht in Holland, and she was a typical person that was willing to help people—not only those doing astronomy—but just helping people in difficult circumstances. Moreover her subject of interest in astrophysics of stars was almost identical to ours.

Grygar: [01:14:26] When she realized that there is some possibility to go behind the Iron Curtain, she did it. I had my mentor, Professor Miroslav Plavec [1925-2003], who had advised me to translate my thesis written in Czech through my spoken English to Underhill. I did it with great difficulties because I almost cannot express in English although I was fluent in reading. However she understood. Technical things are more or

less international, so the subject of my thesis was comprehensible to her. Three months later after her return back to Holland I received an invitation for a three-month stay in Utrecht. She stated that my stay will be supported by a grant for young astronomers from the International Astronomical Union.

Grygar: [01:15:20] For me it was an impossible mission, because in that time only the scientists who were members of the Communist Party could occasionally travel to western countries. I was not a member. Nevertheless I tried to apply for such permission. The first step was to ask the director of our Institute Dr. Bohumil Šternberk [1897-1983] for the approval of my trip. There were about seventy science institutes within Czechoslovakian Academy of Sciences, and I believe that he was a white crow among the directors, because he also was not a member of the Party.

Burnett: [01:16:09] —not a member.

Grygar: [01:16:12] First I had to go to the Director for getting the permission from him to accept this exclusive offer from Holland. My visit in his office started rather uneasily. The Director said: “You know, you are single... you have to go to the Western country...”. He was apparently embarrassed.

Burnett: [01:16:43] —conflicted.

Grygar: [01:16:45] Finally he said: “Could you guarantee that you will not defect to the West?” I told him, “Mr. Director, if I give you my honest word that I shall return, would it be sufficient?” And he paused for a while. And then he said, “You know, yes, this is sufficient.” However, this was only the first step.

Burnett: [01:17:26] Yeah, and you did return!

Grygar: [01:17:28] Yes, I did. But the story was much longer.

Burnett: [01:17:30] You kept your word.

Grygar: [01:17:31] Yes. It was impossible to cheat. So I almost went, because this was all only almost. There were many obstacles still on the road.

Burnett: [01:17:44] You almost defected?

Grygar: [01:17:45] No. I was still sitting in Ondřejov and I have to applied for the visa. I cannot apply for a Dutch visa before getting the written permission from the Czech Ministry of Interior. I applied for the permit but for two months the Ministry of Interior did not reply. Professor Underhill has urged me when I will go because everything was ready in Holland while I still await in Ondřejov without any reply from the Ministry. Then I was pretty sure that I couldn't obtain the permit because I am not a member of the party. Finally I went to the Secretary of the Communist Party of our institute, and asked him who is minister of the Ministry of Interior.

Grygar: [01:18:17] The Secretary gave me the name of the minister. Then I wrote a personal letter to this person. In the letter I explained that I got the invitation, that I fulfilled all of the requirements, that my fellowship in Holland is very important but I do

not have the permission from the Ministry of Interior. Finally I asked the minister to give me an advice what should I write to my impatient Dutch professor. Again nothing happens. However after a week or 10 days, I travelled to Prague to a large Czech astronomy meeting in Prague. We were listening to lectures in rather big hall. Suddenly I saw a lady from the local staff coming to me. She asked me if I am Grygar. I said, “Yes, I am.” She was rather scared and said, “you have a call from the Ministry of Interior.” I went to a corridor to the telephone. Some official from the ministry said, “You know, you wrote the letter to the wrong man, because the minister of interior is another man. But anyway, yes, we shall give you the permission.” Then I realized what has happened. The former minister of interior to whom I addressed my letter was in the meantime promoted to the Vice-premier of Czechoslovakia. And because of the tone of my letter, the new minister was apparently convinced that I am a friend of his predecessor.

Burnett: [01:21:02] So you went *more* to the top!

Grygar: [01:21:04] Yes.

Burnett: [01:21:05] And they said, “Take care of this man!” [laughter]

Grygar: [01:21:08] Finally with a month delay I for the first time in my life had a possibility to see the life on the other side of Iron Curtain. Initially, my Fellowship in Holland was scheduled from September to Christmas, but due to delay I had to stay in Holland till the end of January. However, I was very happy to see the life in a democratic country. All astronomers but even anonymous Dutch people were very attentive and friendly. I got a possibility to go to concerts and galleries, play volleyball with new friends. I did a lot of work with professor Underhill and met many famous astronomers in four Dutch universities —Holland astronomy is first-class in the world. They have several first-class universities in Amsterdam, Utrecht, Leiden and Nijmegen with strong astronomical departments. Dutch teaching schools of astronomy are among the best in the world. Suddenly, I got in such a position I did not dream about it before. I spent there a very fruitful three months. I published two papers, returned back, and after two years, in 1966 — in that time I was already married—I received new invitation, and I could take all my family with me for half a year Dutch fellowship. After returning from both stays I was not contacted by the Secret Police [*StB*] while I knew that these requests were probable.

Burnett: [01:22:37] Yes. And you had the trust by then of the institutions.

Grygar: [01:22:39] Yes.

Burnett: [01:22:40] So you went back, but you’re developing this international scientific community, scholars you can learn from and who can learn from you.

Grygar: [01:22:51] Yes.

Burnett: [01:22:54] And so that was a happy period.

Grygar: [01:22:56] It was a very good period.

Burnett: [01:22:58] And did it seem like it was becoming, that this was part of a trajectory of reform?

Grygar: [01:23:07] Yes. I think that there was some positive interaction between the United States and the Soviet Union. And I think the thaw almost immediately appeared also within East-bloc little countries. However the freedom was greater in Poland. Polish people may always leave their country without punishment if they stayed there forever.

Burnett: [01:23:35] To go to the West.

Grygar: [01:23:35] Anytime, they could go to the West. East Germans had difficulties and we had great difficulties, Hungarians had great difficulties, Romanians were in a much worse position. So it was seen that there were some changes, and I had no problem to defend my PhD, although I was not a member of the Party. There were, of course, some attempts to call me to be a member. Nevertheless I always declined such offers.

Burnett: [01:24:16] Okay. There were requests. it was expected.

Grygar: [01:24:20] It was expected that *before* the defense, I would enter the Party.

Burnett: [01:24:27] Right. And so, it was not absolute, but really pretty much a requirement.

Grygar: [01:24:35] Yes.

Burnett: [01:24:36] If you want to be a professor in university, not so for the Academy of Science.

Grygar: [01:24:41] The Academy of Science was certainly more liberal. It was because we officially could not teach students.

Burnett: [01:24:50] Yeah. That was the danger?

Grygar: [01:24:53] That was the danger.

Burnett: [01:24:53] You had to have the correct ideology.

Grygar: [01:24:54] Yes. Moreover, the Academy had also the privilege to teach the PhD students, single individuals. Thus I was able to be the mentor for students of astronomy for Masters and PhD. degrees.

Burnett: [01:25:20] Well from a scientific perspective, because, you know, from the United States, it's a very different system. It sounds almost better than the university system from the perspective of research, because it's graduate research. That's what they do across the Czech Academy.

Grygar: [01:25:43] Yes, certainly. Of course, I would be glad to have graduate students, but I would not like to teach at the university because it's a big burden. You probably would be assigned to teach very elementary things, and time is money.

Burnett: [01:26:01] But you mentioned something that it was a second class—so “Professor” is the highest academic position in that universe, and a member of the Czech Academy of Sciences who is working in an Institute is at a lower, even if you have a PhD, it’s a lower thing.

Grygar: [01:26:20] In 1966 I received second Dutch fellowship. I was even allowed to take my family to Holland where we have spent exciting six months. I did a lot of work at the Observatory but we also had time to travel to other Dutch observatories and visited Amsterdam, den Haag and many Dutch galleries, churches and also a seashore where we admired the protective system *Deltawerken* against sea floods. In 1967, I experienced a very important astronomical event. For the first time in the history of the International Astronomical Union, which is the most influential body in world’s astronomy, its General assembly took place in Prague. The Union preserves individual membership and the criteria for admission are strict. I was admitted to the Astronomical Union in this Prague assembly and during a fortnight I was the editor-in-chief of the daily astronomical newspaper.

I met many famous astronomers from almost all continents. Many years later I have learned that Prague Congress was the first in postwar history when astronomers from Soviet bloc could meet their colleagues from the free world. It was the occasion for many distinguished Soviet astronomers to go abroad for the first time in their life. Thus Prague served as first free discussion between West and East astronomers. Even the astronomers from the Vatican observatory were in Prague, and I drove a Director of their Observatory from Prague to Ondřejov in my Trabant car manufactured in East Germany.

Burnett: [01:27:56] It was like a science diplomacy.

Grygar: [01:27:58] Yes. It was an incredible event.

Burnett: [01:28:02] And then it’s followed very shortly after. Well, in the following year is—

Grygar: [01:28:07] The Prague Spring, yes. So we were very lucky because we were all enjoying the situation when it looked like everything was getting better. However, our geology colleagues organized in August 1968 in the same Congress Hall of Prague the Congress of the International Union of Geology. Two days after the beginning of this Congress Soviet, Polish and Hungarian armies invaded Czechoslovakia. This was a terrible disaster for the Congress, but due to extreme efforts of local organizers all foreign participants returned home without any harm.

Burnett: [01:28:37] And I suppose for students, after the crackdown in ‘68, then ‘69 and ‘70, was it more difficult for students to be neutral, or were they more insistent that you be active in the party if you were a student?

Grygar: [01:28:58] I think of the first two years, ‘68, ‘69 were still relatively good. Actually, I got a fellowship to Canada in that time. Again with the whole family.

Burnett: [01:29:12] And did you go?

Grygar: [01:29:16] Yes.

Burnett: [01:29:14] Which university?

Grygar: [01:29:16] It was not a university. It was a Canadian scientific institute: Dominion Astrophysical Observatory in Victoria, B.C. It was a whole-year fellowship.

Burnett: [01:29:35] So there was still some opening, but you had already established your trust, your credentials, and you were a trusted figure and you were a good ambassador in some ways.

Grygar: [01:29:47] Yes. Right.

Burnett: [01:29:48] And so that was, that was a positive thing. But as you said, the timing was bad for other people and other sciences.

Grygar: [01:29:55] My fellowship was granted by the National Research Council of Canada. The fellowship could be extended for two years if the Director of the Observatory would approve the results of the Fellow achieved during the first year. I applied for the second year and my request was easily supported by the Director. However, I have to apply for extending our visa for second year also from the Czechoslovakian Ministry of Interior. We got the message from Prague that the prolongation is impossible. Thus, we had to solve the dilemma. Either we could easily remain in Canada forever, or return home after a year. We were sure that for the future of our children it would be better to stay in Canada. However, during my fellowship, we met quite a number of Czechs and Slovaks who were refugees from the year 1948 after the communist coup. All of them were established Canadian citizens of very high standing. However, when speaking with us they were very unhappy that they could not visit their homeland.

Burnett: [01:31:19] They were homesick.

Grygar: [01:31:20] They were homesick, because they could not go back even for a short visit. They were Canadian citizens, but the Czechoslovakian government was very hostile and denied them the visa for visiting their homeland. So I realized that this would be for me very difficult because - although technically born in Germany - I realized that in fact I am a faithful Czechoslovakian patriot. I belong to Czechoslovakia, it is my homeland and I have to work for it. It is not a communist country.

Burnett: [01:31:47] Right. Of course. So you made that fateful decision to return.

Grygar: [01:31:51] Yes.

Burnett: [01:31:53] But the question I have, for the Normalization period, is, was there a change around you in terms of how things were for other scientists? Did you see that people had to be much more careful about politics?

Grygar: [01:32:14] It was, again, quite a bad situation. It was not so bad that—people were not executed anymore, but still the dissidents were condemned to long years in prison, they were physically attacked or forced to exile with a loss of home and property.

And again, the permission to go abroad got more difficult, more difficult, more difficult, more difficult. And I was finally fired in 1980 from the Institute of Astronomy.

Burnett: [01:32:45] You were fired?

Grygar: [01:32:47] Yes.

Burnett: [01:32:47] Why were you fired?

Grygar: [01:32:48] For our Christian faith. Because my family is Roman Catholic. We were living in a small village Ondřejov, where we were going to church every Sunday and we were sending our children to religious education. Officially in our Constitution we had the article about religious freedom, but in reality all religions were under strong supervision and many people were persecuted in work if they were too active.

Burnett: [01:33:10] And that was subversive activity.

Grygar: [01:33:13] Yes.

Burnett: [01:33:22] So, what was your reaction to that?

Grygar: [01:33:27] Well, I had no choice. I had to leave.

Burnett: [01:33:35] Did you think that something like that could happen?

Grygar: [01:33:38] Yes, I expected it, because I knew a lot of people who were in a similar position. So I was really prepared for such a possibility, although I thought that the very able director of our Institute would protect not only me but all other scientists. Dr. Luboš Perek whom I knew from the Brno Astronomy department was elected the director of the Astronomical Institute of the Academy in 1968 and stayed in this position until 1975 when he was named the Chief of the Office of UN Secretary General for Outer Space Affairs in New York. Perek was a safe umbrella under which we could work normally. I had no problems in that period. People who were fired from the Communist Party had no problems. If people who were fired from the Communist Party from other institutes went to Perek, he employed them, not in the scientific positions, but in positions as technicians, and so on. However, they may proceed with their studies normally. So Perek was really a great man. He's *still* a great man [Perek died September 16, 2020 at the age of 101].

Burnett: [01:35:02] So there were these figures who were able to protect—

Grygar: [01:35:07] Yes, protect.

Burnett: [01:35:09] Černohorský was also a figure.

Grygar: [01:35:10] Also the same type of person, yes.

Burnett: [01:35:12] —and I don't know how they did it, but they were able to say, "This person is an important scientist; I *need* this person because they're a technician. They have these skills. Don't fire them; I will take them."

Grygar: [01:35:29] Yes, yes. And Černohorský was never a member of the Communist Party.

Burnett: [01:35:43] Yes. Yes. Well, so, but that's a scary thing to happen, to have happen, to be fired and you're in a senior position and so did you look then for contacts and connections to—

Grygar: [01:35:59] My problem in *Ondřejov* started after Perek went in 1975 to the United States as a Chief of the UN Office for Outer Space Affairs. And then we got the new Director of the Institute, who was a staunch communist. And then I had immediately clashes with him. One story—

Burnett: [01:36:29] What year was this?

Grygar: [01:36:31] Perek went away in 1975, and in 1974 we experienced another big story. The United States had this Apollo Program and several American astronauts had Czechoslovakian roots. One of them is Eugene Cernan [1934-2017]. Remember that name. His grandfather was born in Slovakia and went to the United States at the beginning of the 20th century, and his grandmother was born in Southern Bohemia and that family also went to the States to the same place. Their children were married in the United States. They were the second generation and Cernan was the son of this second generation couple. However, he remembers his family roots very well. He even remembered some Czech and Slovak words—he said that if his parents were willing to speak something that the children should not understand, they spoke Czech and Slovak. [The languages are so similar that practically no translation is needed.]

Burnett: [01:37:52] So they observed culture that way. [laughter]

Grygar: [01:37:55] Cernan was very keen on his Czechoslovakian origin. So when he went as the last captain of the Apollo 17 to the moon, he bought, for his private bag, a Czechoslovakian flag, a small one, in some American store. He brought this flag to the moon. He put it on the soil. Yeah. Then he returned it back, and his idea was that he would give it to the Czechoslovakian people.

Burnett: [01:38:36] Wonderful.

Grygar: [01:38:37] And he did it. But there were complications because he was an American astronaut, so it was impossible that he would be invited officially to Czechoslovakia in that time. So he did it very carefully. In that time in Bratislava, the capital of Slovakia, every year took place an international trade fair for chemistry. For international fairs it is required every journalist of any country should be given the visa, otherwise the Fair would be denied to be international.

Burnett: [01:39:20] There's no coverage.

Grygar: [01:39:22] So Cernan himself has applied as a journalist for this fair. Of course, he was not interested in chemistry; he was interested in visiting the places where his grandparents were born. So first, he went with the aid of the American embassy in Vienna to the Slovakian place. The situation became crazy because when it was clear that

American astronaut is there, local mayor and his staff fled from the Village Hall building in order not to meet American astronaut. And local people advised Cernan to go to the office of village agricultural cooperative. However, the chairman of the cooperative locked the doors of the office.

Burnett: [01:40:19] Wow. They just did not want any—

Grygar: [01:40:22] They were afraid.

Burnett: [01:40:23] Yeah, of course. If they were photographed or associated at all.

Grygar: [01:40:28] Yes. This was really very stupid reaction to an American (and Slovakian) hero. However, Cernan with the aid of American Embassy in Prague tried to give the Czechoslovakian flag to the president of Czechoslovakia but his chancellor refused to receive it. The same story went to the Prime Minister and the President of Czechoslovakian Academy of Sciences. The Embassy then asked Director Perek and he agreed to accept such valuable souvenir.

Burnett: [01:41:24] So he took it. But Perek accepted an offer to work in the UN Office for Outer Space the following year, in '75.

Grygar: [01:41:26] The story is still—

Burnett: [01:41:28] Still weirder. Okay.

Grygar: [01:41:30] Cernan arrived with the American ambassador in a car to Ondřejov. And because the greatest instrument we had in Ondřejov at the time was, and still is, the two-meter Zeiss telescope, of which I was the chief, the suite came into the huge observatory dome. I had the privilege to explain to Gene Cernan the task of the telescope and what we observe with it. However, I used the opportunity and asked him to make a short interview that I would like to publish in the Czech language and he said, “Go ahead, young man.” So I did the interview with Cernan and I published it in the Czech astronomical bulletin that was printed by Xerox machine and circulated among the members of Czechoslovakian Astronomical Society. The point was that such bulletin was not censored. Officially we were instructed that during Cernan’s visit that no written notes are permitted.

Burnett: [01:42:26] Xerox, like a newsletter.

Grygar: [01:42:26] Newsletter. Yeah. However, I managed to scribble the notes of my interview. The main part of Cernan’s visit to Ondřejov Observatory took place in the Institute’s library. Cernan revealed the mount with the Czechoslovakian flag, logo of Apollo XVII and photograph of Cernan standing close to the American flag, its pole pointing to distant Earth. He then handed the mount to the Director of the Astronomical Institute Luboš Perek. The atmosphere in the library reading room was fantastic, indeed. The next day, Dr. Perek gave me the mount to glaze it and then to fasten the framed picture to the pier of the two-meter Zeiss telescope. In these times such simple task was rather complicated. I was afraid of damage or theft of the unique lunar souvenir. It took several months to have the lunar mount fastened to the telescope pier. We had special visitor gallery in the dome of the big telescope, safely detached from the telescope

interior. Thus, many visitors to our Observatory were able to watch the lunar gift from distance. However, the next year Perek departed for the UN in New York. New director of our Astronomy Institute was a staunch communist. Unfortunately, he had his own key to our visitor gallery and once upon a time he wished to show the behemoth telescope to prominent guests. He had, of course, noticed this Czechoslovakian flag from an American astronaut. Next day, I was called to the director. He asked me why we have such provocation at the pier. I explained that his predecessor instructed me to arrange the lunar souvenir. New director said that it is impossible publicly disclose such a souvenir from the United States because we have no adequate souvenir from the Soviet Union. So he ordered me to remove the souvenir from the place.

Burnett: [01:44:07] Okay. Did you keep it?

Grygar: [01:44:09] I had to do it because it was a danger that the souvenir could be confiscated or destroyed. I complied but not quite. I moved the framed picture into the clean room of our spectrograph. I had the only key from this clean room. Since then we have been showing the lunar souvenir only to people who were “reliable.” [laughs] To the clean room the director had not access.

Burnett: [01:44:36] Yes. You put it in the clean room. The only place where no one can go.

Grygar: [01:44:38] Yes.

Burnett: [01:44:40] That’s perfect.

Grygar: [01:44:42] We had, of course good friends to whom we showed the flag there.

Burnett: [01:44:48] Now it’s a charming story, but you know, I hear stories about files, that there’s a file on every individual. And so do you think that there was an accumulation of actions that you were associated with that may have accumulated in the case files?

Grygar: [01:45:12] Yes, I think so, because evidently they understood that I am not on their side.

Burnett: [01:45:20] Many of these stories are not direct transgressions or direct threats to the Party authority. You are not a politically active person, but you were not politically obsequious or a submissive. You were a scientist and you were interested in science, but the fact that you were not enthusiastically embracing party doctrine and active in the Party, that was always a threat to them.

Grygar: [01:45:59] Yes. So, when I was the chief of the two-meter telescope, of course, in that time, I had several students for graduate studies, and they all graduated, and they became very good scientists. Even in Brno, there are some people who were from my hatchery. I supervised also other students preparing them for diplomas and dissertations in the time when Perek was director. But this fairy tale ended with the new director. I was accused of corrupting my students. Technically, I really corrupted all of them. None of my students joined the Communist Party.

Burnett: [01:46:28] Yes. [laughter]

Grygar: [01:46:29] In 1978 I had another clash with the new Director. In that time a geophysicist from the Geophysical Institute of the Academy Jiří Mrázek [1923-1978] was extremely popular because he was the only competent person who was able to comment seriously on astronautics and space science activities. I was in rather frequent contact with him. Soon I have learned that besides his profession he was also a lay monk, a member of Franciscan's Third Order.

Burnett: [01:47:11] Okay. He was a lay monk of the Franciscan Third Order.

Grygar: [01:47:14] He was married and had children but as a lay monk he was very active in disseminating the Christian faith throughout Czechoslovakia. He was extremely popular as a TV speaker. However, in the year 1978 he got ill, and in November he died of cancer. His catholic burial at the big Prague cemetery took place at the open space. I guessed that several thousand people came to the funeral ceremony. He was so popular in that time. And, of course, the funeral ceremony was Catholic. And at the end of the whole ceremony, the priest said, "Now we wish the peace to brother Jiří and we shall pray the Lord's Prayer. And almost all participants at cemetery prayed, except two important communists. One was the Director of the Geophysical Institute and the second was my Director of the Astronomical Institute – both faithful communists. Incidentally, all three men studied simultaneously the same faculty of Mathematics and Physics; they were colleagues during their studies.

Burnett: [01:49:03] Aloud.

Grygar: [01:49:04] Aloud. This was one of the greatest experiences in my spiritual life. Three days after the burial, I was called by a secretary to my director's office. And the conversation I do remember rather well.

The director asks, "Did you know that Jiří Mrázek died?"

"Yes."

"You know that he had a Catholic burial?"

"Yes."

"Have you been there?"

"Yes."

"Did you hear how all people prayed for Jiří Mrázek?"

"Yes."

"Did you?"

"Yes."

And then he said that it was very great discomfort for the whole Academy of Sciences, because a well-known scientist had a Catholic funeral. Therefore he would be happy if I would not die as a scientist of the Astronomy Institute because my catholic funeral would be a great shame for him, for the Institute and for the whole Academy of Sciences. Thus, he asked me that as long as I shall be a member of staff of the Institute, not to die!

Burnett: [01:50:40] Under the Catholic tradition?

Grygar: [01:50:41] Yes. I understood the message. He expected me to leave the Institute.

Burnett: [01:50:57] Right, so this was another step in that path. So it was a relationship that was souring over years.

Grygar: [01:51:06] Five years. And then, I was deprived of master's or doctoral students.

Burnett: [01:51:30] [laughter] So, so, you made then a transition.

Grygar: [01:51:36] Yes.

Burnett: [01:51:37] You had to. You had children at this point. How old were they?

Grygar: [01:51:43] In '78, they were 15 and 12.

Burnett: [01:51:49] And then when you were in '83, five years later, they're still young and, and, and there are consequences. You could have—I understand, one of the punishments of ostracization during that period was that your children would be forbidden to go to school?

Grygar: [01:52:07] Yes, this was the risk that they would also be deprived of studies because, even for going to a grammar school, you had to have permission from the local organization of Communist Party, although we parents were not members of the Communist Party. However, I had again some good luck. I have learned from my university school mate who worked in the Institute of Physics in a small village Řež [c. 20 km north of Prague] that they are going to open a new department studying remote sensing of the Earth from artificial satellites. This sounds very attractive because it was like inversion astronomy. Normally astronomers from the terrestrial observatories study the outer space objects. Remote sensing is studying the surface of Earth from outer space. Thus, both technologies are very similar. I contacted the boss of the Department of Low-Temperature Physics and after about three months the deal was fixed and I left Ondřejov Observatory after 21 years there. I soon realized it was very good decision. The whole Institute of Physics was full of people without Communist Party membership. Stupidities that I experienced in Ondřejov were non-existent there. Within a year I learned the principles of remote sensing and with my new and very competent colleagues we started experiments based on infrared detectors. By the way, about five years before leaving Ondřejov I wrote a paper about the use of infrared observation in astronomy. Infrared observations are possible only if you cool your detectors to very low temperatures [-196° C to -270° C]. Another good fortune.

I joined very competent and friendly team. Moreover, I received better salary than I had in Ondřejov. I told my new boss, who was, of course, a member of the Communist Party, my Ondřejov story, why I was fired from the Institute, and he said: "You know, what you are doing in your free time is your business. I would only evaluate you according to what you do in the office hours."

Burnett: [01:54:07] So you embarked on a new research program.

Grygar: [01:54:11] Yes. Suddenly I felt very happy. I was going to learn a completely new part of astronomical business, which wasn't in the Eastern Bloc at that time evolving well. So I wrote new papers and I found very many physicists with whom I was able to communicate because I can offer them my astronomical knowledge, in classical

astronomy; but also of prospects of infrared astronomy. In the East Bloc was very difficult to do anything in infrared, and we in Řež had the privilege that we had very good low-temperature laboratory. Our laboratory has achieved in that period a record of the lowest temperature among all laboratories in the world, near absolute zero.

Burnett: [01:55:01] Wow. That's an achievement. Yeah, and there's nuclear research in that town, Řež.

Burnett: [01:55:08] Řež was rather small village detached in a deep valley. For that reason it was also selected for nuclear research. But this research was concentrated in an industrial Institute of Nuclear Research, that did not belong to the Academy of Sciences.

Grygar: [01:55:10] Yes. So until the end of communism, I was employed there. To my surprise in 1983 I was invited by the University of Texas in Austin to the so-called Texas Symposium on Relativistic Astrophysics. The University suggested to paying my travel expenses and accommodation plus per diem expenses. The Foreign Department of our Academy supported my trip by a loan of USD 5 dollars that I had to reimburse after the return. So I flew from Prague to New York and Austin, saving the loan for emergencies. In that time as a Czechoslovakian citizen I could not have private accounts in foreign currencies. The first Texas symposium on Relativistic Astrophysics was hastily organized in Dallas, TX in late 1963 after the discovery of quasars – very compact objects with ultrahigh luminosities. My invitation came before the XIth Texas Symposium in December 1982 held in Austin, TX. I delivered there our paper of five physicists about the prospects for detecting the strength of magnetic fields in the so-called pulsars that were identified in 1965 as very small [26 km in diameter!], very fast-rotating [less than 1 second!] neutron stars. If the rotation axis of a star is inclined to the axis of an ultrastrong magnetic dipole, narrow jets of energetic particles are ejected into open space. If the direction of a jet is directed toward the Earth, very short, strictly periodic radio pulses are seen with radiotelescopes. [In 1974, UK scientist Antony Hewish (1924-) was awarded the Nobel Prize for the discovery of pulsars.] In that time, my colleagues in Řež developed extremely sensitive detectors of magnetic fields called SQUID [Superconducting Quantum Interference Device]. Thus, we calculated the probability of measuring strong magnetic fields of the closest pulsars with these detectors. I presented these calculations during the Symposium.

Burnett: [01:55:56] That's phenomenal. Well, there are so many aspects of your careers that we can't explore in two hours, so I think we need to meet again at some point, but I want to ask you about this. The origin of your encounter with astronomy was through science popularization. And, you begin a life as a public intellectual, and as a scientist who is deeply engaged in popularization for the Czech public. Can you talk about when that happens and why that happens, and a little bit about that side of your life?

Grygar: [01:56:49] Yes, my first serious attempt to popularize astronomy started in Brno in the year 1953 when I was a student at the grammar school and already a younger astronomy partner to Luboš Kohoutek. Early in that year in the Arts House of the City of Brno it was opened a large exhibition "The Evolution of Universe, Earth, and Life". Before the opening the curators were looking students for serving as guides to the public in the afternoon hours. We both with Luboš applied for this job and had to pass a discourse about our knowledge with university students of astronomy. We passed the tests very easily. And therefore, after school, I often for a period of three months served

as a guide in the exhibition halls. However, very often the guides for the section Earth and Life absented. In such situation the visitors asked me to proceed with them further. Due to my university teacher [Stanislav Vosyka, 1902-1986], who was demoted to middle school, I was rather well informed about geology and meteorology. Due to a school inspector Kohoutek [1905-1978], who was demoted in a similar way, I was reasonably well informed about chemistry and biology. In general, I was surprised how low and erroneous was the knowledge about science among adults. I tried to explain the science discoveries by parables of daily experience. This simplicity works surprisingly well.

Grygar: [01:58:33] Moreover, very soon I saw that most people share the same prejudices that were repeated almost identically by the majority of visitors. For me these rather silly questions of the audience were valuable materials for inventing new approaches to correct explanations. The next impulse opened in 1954 when I started university studies and simultaneously a public observatory in Brno Mt. Božov was opened. The observatory needed demonstrators for evenings at the telescope. We with Luboš were again successful in tests and spent a lot of evenings in the observatory dome. To our surprise we realized that the visitors came to the observatory even in the evenings when the sky was totally overcast, sometimes even during rain. They came to the hill, they paid the entrance fee and they expected something. So you had to say to them, “what you *would* see if it were clear....” [laughter] Because in the dome we cannot use lights, the visitors were almost invisible. However, they were much less shy to ask silly or sometimes very good questions. Thus, I enjoyed the bad weather during my service. Sometimes, of course, some smart guys asked questions that I was not able to reply. Thus I remembered that question for private study of the proper literature. Within a year my ability to explain tough questions considerably improved. I found astronomy definitely extremely interesting and beautiful.

Burnett: [02:01:07] That’s the impetus. And it led to—and then we can talk about this another time—but the development of a television series. And is the title derived from that first book that you saw, because in English, it’s called “Wide-Open Windows of the Universe.”

Grygar: [02:01:30] Ah. That story was raising during many years. When I was the boss of the two-meter telescope and the telescope was new, many journalists from all over Czechoslovakia came to Ondřejov to interview me about the telescope and its program. I realized soon that knowledge of science and particularly astronomy among journalists was generally very, very poor. But once upon a time, I was interviewed by a first-class journalist from Technical Magazine who was to my surprise competent and educated in the subject. His questions were logical and on the spot. His name was Vladimír Železný [1945-]. When he has sent me our interview for proofreading I did not need to change a character. Beautiful interview.

After some time I had a lecture in Prague Planetarium which Železný was attending. He was in that time employed as a journalist for a monthly called *Technical Magazine* [*Technický magazín* = “*těčko*”). In this monthly, the editors cover not only progress in techniques, but also in science, history and even philosophy. “*Těčko*” became very popular and good journal. After the lecture he invited me for the short talk in a near pub. Vladimír stated that popular science books were obsolete and the people are not aware about recent progress in all science. He has asked me to publish in *Těčko* a series of

articles about astronomy discoveries that are not yet printed in textbooks. I agreed that the new discoveries are virtually unknown to the laymen and I was pretty sure that I can accept this challenge. However, I was uncertain about the title of the series. Vladimir suggested: what about “The Windows of the Universe, Open Wide?” I enjoyed this slogan immediately.

Burnett: [02:03:54] That’s interesting. You are known—this is from an English perspective—as the Czech Carl Sagan. So you had an audience, a national audience. And I noticed on YouTube you have lectures in the views, in the hundreds of thousands, 170,000 for *each* lecture.

Grygar: [02:04:20] Yes.

Burnett: [02:04:21] So, there’s a massive Czech following of your lectures.

Grygar: [02:04:27] In retrospect, I see that the following TV series would never have occurred if I had stayed in Ondřejov Observatory for ever. In the seventies I had problem with our book *The Universe* [*Vesmír*] because in it I revealed that modern cosmology theory that is called Big Bang. Communists were strongly against this concept and I was the first who published in Czechoslovakia a popular explanation of the Big Bang theory. Therefore I was forbidden speaking on television in Prague, Brno, and Ostrava studios of the state television [no private TV channels were permitted]. However, a Slovakian TV studio in Bratislava was slightly liberal and Železný, who was also persona non grata in Prague, Brno and Ostrava, collaborated with Bratislava TV studio under a cover name Vladimír Silný. I travelled to Bratislava independently before every Christmas to give a public lecture about advances in astronomy in the large lecture hall for 400+ listeners.

Grygar: [02:05:12]. Once after my two-hour lecture I discussed with the audience for almost three hours. After almost five-hour marathon I was approached by a member of the editorial staff of Popularization of Sciences of Slovakian TV. He has asked me whether I could prepare a series of such talks for the Slovak TV. I replied “okay, I would be able to do it, but I am not a screenwriter; I cannot prepare the screenplay only. He replied, “Don’t worry. We have in Prague an excellent screenwriter, Vladimír Železný, who is writing screenplays for us very often. Because I independently knew Železný from *Téčko*, I was confident that with his help we can adapt the printed series from “*téčko*” into a television show. Železný knew the best Czech comics painter Karel Saudek who was in a difficult opposition with the regime, because comics was invented in the U.S.A. Thus the TV series was prepared by two people who were nonpersons for the regime and myself who could appear on Slovakian TV only.

Burnett: [02:06:55] It’s wonderful. Well, I have so many more questions about all of these subjects. But perhaps we could just conclude with your reflections on your long relationship with Martin Černohorský and this trajectory of Czech physics after the Velvet Revolution and into the future?

Grygar: [02:07:21] Yes, I think that Martin Černohorský is really a unique phenomenon although I was well prepared for great personalities used to the excellent “degraded” professors at the grammar schools. Černohorský in that time was only an assistant, the lowest grade of university hierarchy, but his erudition was on par with distinguished senior professors with brilliant careers.

Burnett: [02:07:50] Yes, he is unique.

Grygar: [02:07:52] Yes. When we had the basic four-semester course of physics, the base of fundamental physics, I was astonished that this most important course will be read by the assistant. I expected that fundamentals of physics should be read either by at least an Associate or better by a Full Professor. However, after *ten minutes* of the first Černohorský's lecture, I changed my mind because it was an incredible presentation, from a pedagogical point of view and due to the high level of factual contents. During his second lecture he suggested to us that complementary to his regular lectures every week, he offers an optional seminar for students that would like to have deep insight of selected physical problems. To his surprise we *all applied* to join the seminar. Many years later Černohorský confessed that he was very surprised by our collective action. During these seminars, I think we all fell in love with physics.

Grygar: [02:09:30] The seminars were very demanding. A couple of fellow students were obliged to prepare the concise explanation of some aspects of physical fundamental theories or experiments for other members of our class. We had to study the background materials in foreign languages: English, German, French and Latin. I preferred Latin!

Burnett: [02:09:52] It's this, it was a wonderful experience. And you learned by teaching. That was the technique.

Grygar: [02:09:57] Yes. Yes, and it was perfect. Alas, many years after finishing University, I learned from Martin that we were the first group in his own career when he had the opportunity to prepare students for science careers in physics. Thus we served as a test bed for his fundamental course of physics and his innovative seminar.

I believe that eleven students finished the course. Six students gave up or moved to other curricula. However, our group of eleven was very successful in their academic careers.

Burnett: [02:10:38] Just a wonderful—he was there at this moment of this rebuilding of Czech science and Czech physics in particular.

Grygar: [02:10:43] Yes, and he knew very well what to do.

Burnett: [02:10:50] Right. And you've maintained contact with him over the years?

Grygar: [02:10:53] I did not interrupt contacts with Martin even after my departure from Brno to Prague, Ondřejov, and Řež. Martin always served as my solid anchor.

Burnett: [02:11:23] He remains the teachers of the teachers. He's a mentor to those who have been tremendously [influential in their own right].

Grygar: [02:11:28] He's more; he's also the spiritual leader, because his attitude toward right and fair doing is incredible. He served all Czechoslovakia and now the Czech Republic as a sharp critic of unjust behavior and fraud in science. And he succeeded many times to eliminate people who do not meet high scientific and moral standards.

Burnett: [02:12:21] High scientific standards, and high moral and ethical standards.

Grygar: [02:12:25] Yes.

Burnett: [02:12:26] Right. And so that, that's, that becomes essential to the reconstruction of the institutional form after the end of communism.

Grygar: [02:12:36] Yes. Yes. And he has the ability to find a way, and he has the ability to realize who is appropriate for the proper subjects.

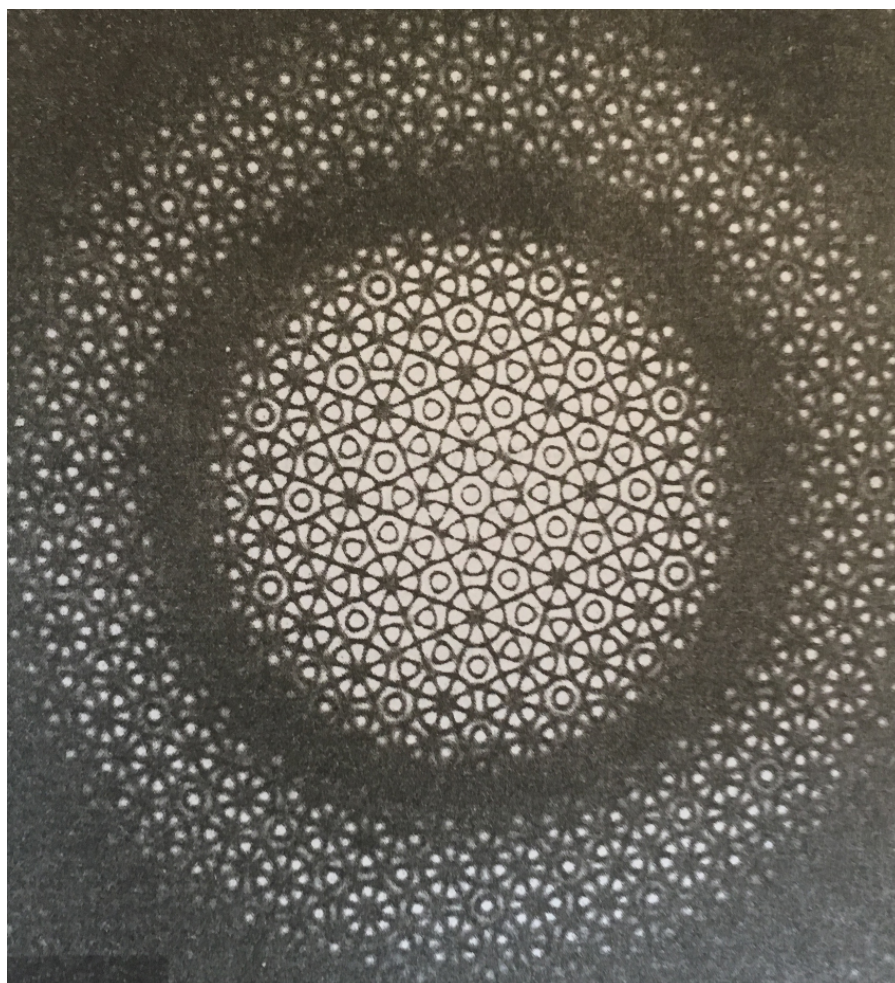
Burnett: [02:12:50] Yes. He identifies talent, and is able to help them realize that.

Grygar: [02:12:55] During all these decades, I always got simple advice from him what I have to do. It was not an advice. It is, particularly: I *have* to do it.

Burnett: [02:13:11] So, you know what is right. Yes. "This is what you *should*—." Yes, yes. That's wonderful. Dr. Grygar, I thank you very much for taking the time to speak with me, and I hope we have more time in the future.

Grygar: [02:13:26] So we can be in touch through email.

Burnett: [02:13:28] Wonderful. Thank you so much.



Diffraction pattern from the research of Dr. Jiří Komrska

Biography

Since 1993, Dr. Komrska has been Professor of Engineering Physics in the Faculty of Engineering of the Technical University of Brno. For the previous thirty years, he was a physicist with the Institute of Metallurgy and the Institute of Scientific Instruments of the Czechoslovak Academy of Sciences at Brno, specializing in optics and spectroscopy. In 1991, he became a professor of condensed-matter physics and acoustics at Masaryk University before taking his current position.

Burnett: [00:00:00] This is Paul Burnett interviewing Dr. Jiří Komrska for the Martin Černohorský/ Czech Physics Project and it is our first session and it is May 20th, 2019. Welcome, Professor Komrska.

Komrska: [00:00:49] Thank you.

Burnett: [00:00:51] We'd like to begin at the beginning. I am wondering if you can tell me about when you were born, a little bit about your family circumstances.

Komrska: [00:01:07] I was born near Brno, in a small village called Telnice. And my father was a grocer and my mother was a dress maker, but she assisted my father in the shop mostly. And what was interesting is a memory of my mother. She had a great gift to remember or recall numbers, and she could solve quite interesting problems just by heart, without any secondary mathematics. My parents had only a basic education. My mother was able to have in her memory thousands, thousands of numbers. And it was quite interesting. But I was born in 1936. It was before the war.

Komrska: [00:02:31] And the primary school I attended was in Sokolnice, and there was a very, very good teacher there who told us tales during the war, before the front, under the German occupation. And after the war, he continuously transferred it to the Czech history. It was wonderful, so, even now, I know the sequence of Czech kings from that. He was a really, really, great person. His name was Josef Hadaš.

Burnett: [00:03:27] So he was an inspiring teacher for you.

Komrska: [00:03:30] Yes.

Burnett: [00:03:33] And, born in 1936, so you were between the ages of three and roughly nine or 10 during World War II. Do you have any recollections of the occupation?

Komrska: [00:03:52] Yes. A lot. A lot of them.

Burnett: [00:03:54] Was it a difficult time for the family? Were there shortages of food or, not particularly?

Komrska: [00:04:05] You know, it was a German terror. For example, if somebody has done something, stealing—

Burnett: [00:04:22] Food.

Komrska: [00:04:23] Food, yes, with tickets for food. He was immediately arrested, and even some of them were sentenced to death.

Burnett: [00:04:35] So they were killed.

Komrska: [00:04:36] They were killed. Yes. Meat and so on. But it was the country, and there was no hunger there. You know, we had a very simple diet, potatoes and so on, but quite enough. There was no hunger. When the front came, we were covered in a cellar, and then, ten days later, the fighting stopped, the war was over. Everywhere was full of

munitions, so I had a lot of cartridges and hand grenades. It was a wonder that I was not wounded.

Burnett: [00:05:31] So, so the front came and there was ten days of fighting or bombardment from the air?

Komrska: [00:05:38]. Yes. It was quite severe, here, southeast of Brno. There was a potato cellar in a hillside, and half of the village took cover there, several meters underground. And so we were there. I had lots of cartridges and gun powder, everything, because German soldiers quickly left the trenches and the Russians were very happy because of the victory.

Burnett: [00:06:33] They put down their guns and their weapons.

Komrska: [00:06:35] My father told me, never touch anything if you do not understand what it is. So when I saw something strange or a cartridge with a colored bullet, you know, I never touched it because it might be some “doom-doom” or something.

Burnett: [00:06:58] Oh, like in English we say a booby trap?

Komrska: [00:07:01] Maybe.

Burnett: [00:07:03] It’s when they make a bomb disguised as something attractive and you, you touch it and you can be blown up.

Komrska: [00:07:12] Several friends or boys were wounded, really seriously wounded. And here around Brno, you can find the memorials where children died manipulating this and that.

Burnett: [00:07:32] Oh my goodness!

Komrska: [00:07:33] Yes. But at the time, there was a sequence of school reforms, you know, so every second or third year, there was a new system of schools. And I had the good luck to have good teachers. So it was not very serious. For example, two years after the war, I went to the gymnasium, secondary school, you know, but a year later it was destroyed, because the lower classes of gymnasium were abolished and we were sent again to the primary school. But I was sent to Chrlice, and it was probably, and now I understand, there was a secret church there, and a man, very young man, took care of us. We were three boys and he taught us Latin and so on. His name was Vladimír Richter, and he was a mathematician. He graduated from Professor Borůvka, and then in the fifties he emigrated to Austria, and was a professor in Innsbruck, in Medieval Studies. So, going back from the gymnasium was, in fact, like university! [laughs]

Burnett: [00:09:12] So, there was a *realgymnasium* that was, you said, destroyed, meaning they closed it.

Komrska: [00:09:21] The lower classes were closed, from first to fourth grade.

Burnett: [00:09:26] Okay.

Komrska: [00:09:27] And *quinta* to *octava* [fifth to eighth grade in high school] remained open.

Burnett: [00:09:30] Okay. So first to fourth grade was closed and fifth to the middle school was open, and that was after the war?

Komrska: [00:09:40] Yes, it was. This was in '48 after the communist coup.

Burnett: [00:09:47] Okay, the coup d'état of the communist regime.

Komrska: [00:09:51] Zdeněk Nejedlý was the minister of education, and he did it. And then, from this school, I went again to gymnasium [secondary school]. It was supposed to be for four years, but it was only two years because there was another reform which followed a Soviet style. It was an eleven-year school. It was terrible, because we were seventeen years old with children of six in the same building! [laughter]

Burnett: [00:10:36] Oh, in the same building!

Komrska: [00:10:38] It was funny, but you know, there were always teachers there who came from the former time, and it was acceptable. But these permanent changes were very stupid. For example, physics, we had no physics at all, only in the last year, some very, very short course of physics.

Burnett: [00:11:09] So the purpose of education changed and it changed several times. There was a reform, and then two years later, another reform.

Komrska: [00:11:21] And so on and so on. It was really terrible.

Burnett: [00:11:24] So it was unstable for the students. The students could not learn in a consistent fashion. But you learned, and you said you had teachers who were from the previous system and they taught you history and they taught you Czech history, which was a secret. It was forbidden?

Komrska: [00:11:45] Not just forbidden, but changed. You know, it is difficult to describe. Once Masaryk was an idol.

Burnett: [00:11:58] The president.

Komrska: [00:11:59] The president, the first Czechoslovak president. The next year, there was a silence about him. The year after, he was a bourgeois philosopher, and so on, you know? So we did not take it seriously.

Burnett: [00:12:21] [laughter] Was it dangerous though? For example, you know, you didn't take it seriously, but did you have to be careful about what you said?

Komrska: [00:12:36] Yes, yes, yes. We spoke in a different way at home and at school, of course. But some teachers accepted—I remember once when this eleven-years school started—I liked, in the gymnasium, descriptive geometry, and I did very advanced designs in geometry. And then, in this eleven-year school, we had to do a very simple

drawing for doing some nut bolts. And I had done nothing. And the teacher came to me and said, “Well, I also sometimes think that before the vacation I taught at the Sorbonne.”

Komrska: [00:14:05] You know, just expressing that he regrets that the level is completely different. So the teachers were mostly very good, very good.

Burnett: [00:14:19] They preserved a tradition. So for an audience that is not from this part of the world, Brno at that time was part of a very advanced industrial and scientific culture and community.

Komrska: [00:14:42] Yes, scientific, but industrial, surely. There were very good factories here and the workers and technicians were very good and excellent. For example, there was Škoda works, Zbrojovka, Zetor, and so on. It was advanced technology here, and products of high quality.

Burnett: [00:15:15] And was it known before World War II for the production of scientific instrumentation, microscopes?

Komrska: [00:15:27] No, microscopes were made in Přerov and not, as far as I know, in Brno. It was mechanical engineering mostly here, and electrical engineering. Motors.

Burnett: [00:15:42] Motors. That’s true. They did train engines and turbines and things like that. Yes. So it’s a strange world. It’s the communist takeover in 1948. And you are a teenager at this time and you are surviving, you and your fellow students are surviving in this world and adapting and it comes time for you to attend university.

Komrska: [00:16:16] Yes. It was in ‘54. And I applied to Masaryk University to the Faculty of Natural Science. Originally I wanted to study chemistry, you know? Yes. Chemistry. And there was a tendency at that time to direct the students to physics and geology.

Burnett: [00:16:56] And why geology?

Komrska: [00:16:58] Because there are petrol sources in southern Moravia.

Burnett: [00:17:10] Petroleum. Okay. So the oil and gas industry.

Komrska: [00:17:14] In the north of Moravia, there were some raw materials.

Burnett: [00:17:22] —for the steel [industry], iron—

Komrska: [00:17:25] There was petroleum in Ždánský les and they started to take petroleum from there, so geologists were needed. [And to be a professional physicist was not a customary profession at that time here and, perhaps, a social exigency arose.] I was directed to physics. And, in fact, I was glad because I arrived with such a naïve, popular conception of the atomic order and these things, you know? And it was taught in chemistry. So I supposed that it is chemistry. I was happy to see that this is what I wanted to study.

Burnett: [00:18:09] Right, so nuclear chemistry, which would be studied in physics, right?

Komrska: [00:18:12] Yes. Then, at the first day almost, we met Dr. Černohorský there, and he was very impressive. He was something like a mentor, you know? He took care of us. He was interested how we were living, where we were accommodated, you know, and so on. And my parents lived close to Brno, so I couldn't ask for accommodation.

Burnett: [00:18:57] Housing or lodging.

Komrska: [00:19:00] Housing, yes. In the house of my parents there was a shop, you know, and I should help my parents. And it was not possible to study and live at home.

Burnett: [00:19:17] So what did you do?

Komrska: [00:19:18] Well, Černohorský helped me to find a place, you know, a student hostel. And then I found a private accommodation in Brno, because at the time it was very cheap. And my parents understood my situation. It was no problem.

Burnett: [00:19:41] So they understood. Many parents in that situation might have said, "You must help us."

Komrska: [00:19:51] No, it was natural because it was heavy, but mainly noisy and disturbing work. It was absolutely clear that it's impossible to study at home.

Burnett: [00:20:09] So your parents supported your education.

Komrska: [00:20:12] Yes. Always.

Burnett: [00:20:13] You must have the time and the space.

Komrska: [00:20:16] My mother was rather sorry, because other boys lived at home, you know, and she wondered, why I couldn't. But she understood it and the parents were very kind. We were poor, you know? But I could buy any book I wanted. They gave me money, not much, but they believed me that I did not use the money in the wrong way. They were very perfect.

Burnett: [00:20:54] Can you talk to me about your curiosity? Your curiosity is your desire to learn, your desire to know.

Komrska: [00:21:08] It was such an image about the educated people. It was Masaryk, you know, a portrait of Masaryk, and the big library. And so, my ideal was to have a big library, read the books and study and study. For example, I was so naïve that when we were taught at the secondary school about the Czech literature, I supposed I must read all the novels and poets. That's a lot, you know? And I did it.

Burnett: [00:21:56] So you read literature, history?

Komrska: [00:22:00] Yes. Classical Czech literature I know in details up to now, but it stopped with Karel Čapek. The new Czech literature I am not interested in at all.

Burnett: [00:22:19] So modern literature is not as interesting.

Komrska: [00:22:22] I'm not a refined man, but it seems to me that it is vulgar. I don't like it at all. And it often deals with events which I lived through, and I do not like to evoke them.

Burnett: [00:22:36] But the classical literature, the classical themes are interesting to you?

Komrska: [00:22:42] It is a little bit nationalistic, you know, because this 19th century, and the beginning of the 20th century, well, I liked it. I supposed it was my duty to read everything.

Burnett: [00:22:57] Sure! Sure! As a Czech, a citizen of Czechoslovakia and this ideal of the Masaryk era—

Komrska: [00:23:09] Yes. Yes.

Burnett: [00:23:11] —middle class interested in knowledge and learning and education and science. It was also early in your life.

Komrska: [00:23:19] I have some small talent for geometry and mathematics, you know, and not for the arts. And so the teachers always shifted me to science and mathematics and geometry and chemistry and these things.

Burnett: [00:23:49] Because they saw that you had a talent for geometry.

Komrska: [00:23:52] Probably, or something like this.

Burnett: [00:23:54] So you were not just following the curriculum; you were seeking scientific information on your own, by yourself?

Komrska: [00:24:17] But there was a lack of this literature after the war. I wonder why, in fact. Even at the university at the beginning, we had no textbooks. For example, I studied from German and from Russian literature. The English literature was almost absent here. The first papers I read in English in the third or fourth year, when I started to work on the diploma, but German literature was common and a lot of translations of English and French literature were in Russian.

Burnett: [00:25:15] So after 1948, the scientific world is from the Soviet Union?

Komrska: [00:25:24] Yes. Mostly, translations, even in Czech language, there's a basic text book of physics. It was the Friš-Timoreva textbook. It is not bad, but the translation was not very good.

Burnett: [00:25:45] So you found, you looked for more advanced?

Komrska: [00:25:50] Černohorský inspired us in this way. We studied some classical literature. For example, a colleague studied Newton's *Principia* and I, myself, I studied Jean le Rond d'Alembert from a Russian translation.

Burnett: [00:26:10] Wow. D'Alembert. So, the approach, the way of teaching of Černohorský, it was to inspire?

Komrska: [00:26:21] Yes. It was very inspiring. And he followed some tradition, maybe dated from Ernst Mach, demonstration experiments during the lecture. It was very, very impressive. Then for the whole life, when you have a problem, you remember: I have *seen* that experiment and the result was that, you know, and then the mathematics follows it. So it was very impressive, really. And he paid attention to these experiments. It was nice. His lectures were excellent. He was perfect in details, but some parts were omitted. For example, thermodynamics. But it is the university, and you should study it yourself if you need it.

Burnett: [00:27:35] And he inspired you to do that too, to find the information yourself?

Komrska: [00:27:43] From him I had such a hint or a rule that whenever I start to study some problem, I go to the basics, the first paper. For example, when I started with diffraction, I took Augustin-Jean Fresnel, *Œuvres complètes*, or diffraction I learned from an American book, Robert Wood's *Optics*, a very classic book, 1905 it was published. [laughs]. But I understood it and it gave me a working knowledge.

Burnett: [00:28:28] Do you think that's important as an approach, that, to understand, you should begin with the beginning of the process of discovery of a particular branch of knowledge?

Komrska: [00:28:42] It depends, you know. In fact, we had no experienced teachers in physics. Černohorský, he was young. And he could not understand details of all branches of physics. So we were all autodidacts. In fact, if I had started to study diffraction, there was nobody in Czechoslovakia with whom I could consult, you know? So I had to go to the old literature to understand it, because if you take the modern literature, you are shocked that you can't use it, but when you go to the classics— There is a sentence in [Ernst] Mach's *Mechanics*, that if you want to understand mechanics, you must start from the history of mechanics. So it is a question. If you have a good teacher, who is specialized in the branch of your interest, you need not follow the history, start from basics. But if you are an autodidact and led by a teacher of general education, then you should start with the classics.

Burnett: [00:30:15] But it seems to encourage the right kind of inquiry, or the habit or the practice that you need. In order to be a scientist, a good scientist, you need to be able to teach yourself. Others have said, that I've interviewed, they say, "Well, you know, when you finish your training, the next step is to teach yourself."

Komrska: [00:30:57] Yes. Yes.

Burnett: [00:30:58] When you become a scholar, you have to have the skill to learn by yourself. Did the Černohorský approach encourage a community of students who helped each other, or was it a community to discuss with each other?

Komrska: [00:31:24] We inclined to it ourselves. He encouraged it. Yes. But implicitly; it was not any pressure. I have a very good friend who is a very talented experimental physicist. For example, we almost lived together and formed a team.

Burnett: [00:31:52] So it's, it's natural. You are all young, and you were living together and it's part of the culture.

Komrska: [00:32:00] And Černohorský, it was interesting. During the first semester or surely during the first year, he selected us. I always thought I would not be able to continue in my studies. Those who are talented, it was one case, and the other were those who are diligent but not much talented in physics and Černohorský recommended then to go to biology, to architecture. And so at the beginning, we were 20 or 21; at the end, we were 10, so one half. And it was quite a compact group.

Burnett: [00:33:02] And it's a process of selection, naturally.

Komrska: [00:33:06] And it was done in a very honest way.

Burnett: [00:33:14] Yes. So tell me about your graduate research and the inspiration for your expertise.

Komrska: [00:33:28] The study at the university was a little bit strange because it was, you know, after the German occupation and after the communist changes in '48. And we had almost no professors of physics. Černohorský was almost a post-graduate student or something like that. So there was only one professor here, it was a distinguished personality, Antonín Vašíček. He was the founder of the optics of thin films. But he was at this time a Vice Dean and Vice Chancellor and so on, and he was not very interested to pay attention to us.

Burnett: [00:34:32] So he was busy with the administration.

Komrska: [00:34:35] Probably, and he wrote a book, a very good one, well-known book about the optics of thin films. It was a classic, but we did not meet him until the fifth year.

Burnett: [00:34:53] And so he could not be an advisor, a direct advisor. He was just at the top channels.

Komrska: [00:35:05] Černohorský was our tutor at the beginning. But unfortunately, he went two years later, or one year and half later, to the Czechoslovak Academy of Sciences. But we could be in a contact with him and from him, we knew X-ray diffraction. He was specialized on precise measurement of lattice parameters, and we were trained in X-ray diffraction by crystals.

Burnett: [00:35:49] —which is a massive field and a field that's very important for, for the revolution in—

Komrska: [00:35:56] —industry, metallurgy, mineralogy and everything.

Burnett: [00:36:00] And biology, the molecular revolution. And it's all happening around the world in the 1950s. Absolutely.

Komrska: [00:36:09] Yes, but we had no, almost no, instructions in modern theoretical physics. There was no professor of theoretical physics. The late professor Litzmann was at that time a PhD student in Prague, and once every two weeks he came and lectured about quantum mechanics.

Burnett: [00:36:39] So you had one lecture every two weeks.

Komrska: [00:36:44] —by Litzmann, quantum mechanics.

Burnett: [00:36:46] —on quantum mechanics.

Komrska: [00:36:48] And the relativity, we had no lectures on relativity. But we had the instruction, or implicit instruction, from Černohorský to study the scientific literature. So I tried to read the Joos and Sommerfeld textbooks in German.

Burnett: [00:37:09] So you taught yourself quantum mechanics. [laughter]

Komrska: [00:37:13] In fact, only *my* students taught me quantum mechanics.

Burnett: [00:37:19] Your students taught you quantum mechanics by working with them because they adopted those— So that is something that is happening in materials science and solid state physics, is that quantum principles are coming into the field of metallurgy. Is that happening in the 1960s and seventies, or is it later?

Komrska: [00:37:50] I don't know. What I have done was only classical physics, no quantum mechanics. From the university, when I graduated, I was sent to Šumperk. It is a town near Olomouc. From the point of view of physics, I was quite satisfied and glad there. It was very interesting work. They asked me to investigate raw materials for ferrites and for carbides of tungsten, and the orientation of diamonds for drilling.

Burnett: [00:38:36] For drills.

Komrska: [00:38:39] Yes.

Burnett: [00:38:39] In mining.

Komrska: [00:38:40] Yes, and for wildcat wells. Or measurement of high temperatures was another topic. You know, it was quite interesting work for a beginner, for me. I was really satisfied. But you know, after a short time, they came and asked to send me to the mines as a coal miner, because every factory at the time had a duty to send every year several people to work in coal mines in Ostrava.

Burnett: [00:39:18] Wow.

Komrska: [00:39:19] And I was angry of course, and asked, “Why have you asked for me? Why you are sending me to Ostrava?” The answer was, “We have asked for you to fulfill the requirement of coal workers in Ostrava.” So I was sad, angry, and so on.

Burnett: [00:39:48] Do you think it was a kind of political practice?

Komrska: [00:39:54] Yes.

Burnett: [00:39:55] You must have experience as a worker, no?

Komrska: [00:39:56] It was nonsense, absolute nonsense. You know, it was a political instruction. I don't know why. But it was so categorical, you know? And if you live in a totalitarian system, in a small town, it is much worse than in large towns, you know, because they have you completely in their power.

Burnett: [00:40:21] Right.

Komrska: [00:40:22] To be short, I decided to leave Šumperk. And it was not possible, only when you are accepted by a competition to the Academy or university and so on. So I applied— The Institute of Metallurgy was starting. At the time, it was called the Laboratory for the Study of Properties of Metals. And Černohorský was probably asked to build up a physics department there. And so I applied and I was accepted and Černohorský was wonderful. He came to Šumperk and by his personal influence he made it easy, so that I could leave Šumperk and go to the laboratory for metallurgical physics.

Burnett: [00:41:29] Because the authorities in Šumperk did not want to let you go.

Komrska: [00:41:34] Just Černohorský's personal authority, not official. It was wonderful. They could have told him, "We shall not speak with you." But his personality was so pronounced.

Burnett: [00:41:56] It's interesting. He has this— the influence of Černohorský is not an official influence. It's not a rank in a system. He is, he was always, until the Velvet Revolution, outside this system, but he developed an authority that is derived from his charm and his intelligence.

Komrska: [00:42:25] Yes, he has a great talent to find the right people. You know? Whether a laboratory man, or his students, or postgraduate students. After five years, all of them were specialists in some discipline of physics.

Burnett: [00:42:53] Wonderful. So that is a talent for finding a good people and inspiring them.

Komrska: [00:43:00] Yes. So I was in this laboratory under Černohorský and I was supposed to do high-energy electron diffraction, HEED.

Burnett: [00:43:15] In the Institute of metallurgy at, at the Czechoslovakian Academy of Science.

Komrska: [00:43:20] It was only a laboratory at the time, and then it became an institute. And again, we had the freedom to study. I supposed I would not do science. I would serve through HEED the metallurgists, and so on. But he said, no, everyone here must do—now we call it postgraduate studies. So I did, and I started with precise measurements by electron diffraction. It is interesting. You may find the absolute method of measuring voltage by electron diffraction. Just by measuring lengths you can find the high-voltage,

accelerating voltage in the electron microscope. So I did these things. It was interesting because in the literature, there was a precision to 10^{-5} , and when I had done it, I found that the diffraction circles were deformed. Electrons have an electric charge, and when the surrounding charge is present, their trajectories are influenced, and the diffraction circles were not circles, but slightly deformed. And it was impossible to measure better than 10^{-3} , not 10^{-5} . And this was the beginning.

Burnett: [00:45:09] So it's experimental research to refine or change the theoretical or official descriptions of the procedures?

Komrska: [00:45:25] Yes, but it is related just to the precise measurements by HEED, which is almost a curiosity. In any way, it was the most precise measurement I had ever done. It was '63. [Chuckling] Yes.

Burnett: [00:45:34] And so that's the absolute method.

Komrska: [00:45:38] It is the absolute method, meaning that you do not relate the measured value to a reference value of the same type. The voltage is measured by measuring lengths. No reference voltage is needed; this is the absolute method.

Burnett: [00:45:54] Okay. And in the contrasting method is the direct method?

Komrska: [00:46:01] No. The relative method. You may have a reference voltage and you compare the two.

Burnett: [00:46:10] Oh, I see.

Komrska: [00:46:11] This is the relative method, because it depends on a reference quantity of the same sort. This absolute method doesn't depend on anything. You just measure the lengths, and, knowing the lattice parameter of the specimen, you can evaluate the accelerating voltage.

Burnett: [00:46:25] By doing this, you discovered that the circle is deformed, and therefore it's less accurate by two orders of magnitude. So, it's experimental work that is challenging or interrogating the official theoretical principles behind high-electron, high-energy electron diffraction?

Komrska: [00:46:54] It is not important for the theory. It was just a warning: Be careful with precise measurements by electron diffraction. And then, in 1963, I got the idea for the thesis. It was already in Šumperk, three years earlier, that I had read Max von Laue's *History of Physics*, and there I found a paragraph about the Möllenstedt – Düker experiment. Do you know this?

Burnett: [00:47:14] No.

Komrska: [00:47:19] Möllenstedt and Düker. I will show you.²

² Möllenstedt G., Düker H. "Beobachtungen und Messungen an Biprisma-Interferenzen mit Elektronenwellen." *Zeitschrift für Physik* 145 (1956): 377-397; Komrska J., V. Drahoš and A. Delong, "Intensity Distributions in Electron Interference Phenomena Produced by an Electrostatic Bi-prism." *Optica Acta* 14 (1967): 147-167.

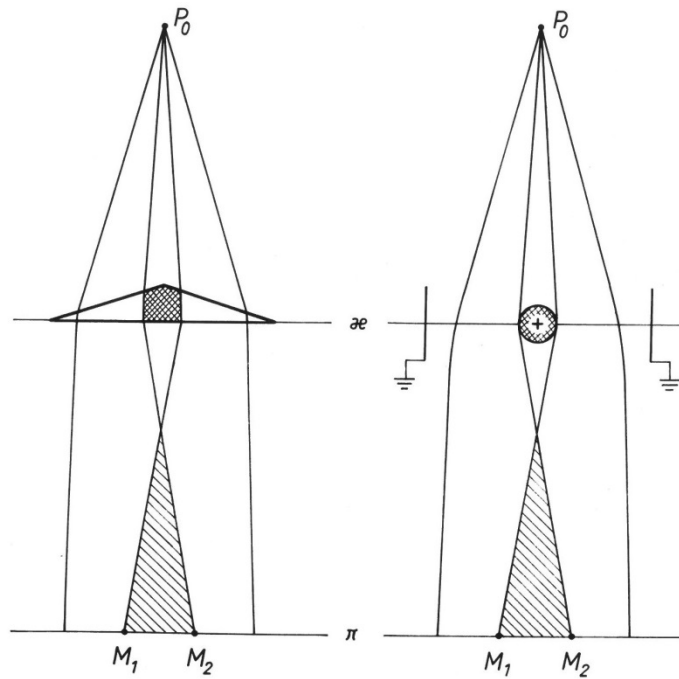


Figure 1. Fresnel biprism in light optics and Möllenstedt-Düker biprism in electron optics.

Look, it was done in such a way that there is a source of electrons here, P_0 .

Burnett: [00:47:53] Yes. Okay.

Komrska: [00:47:57] Here are ground plates, and here is a very thin wire. And if you put positive potential on the wire, the electrons go like that and here.

Burnett: [00:48:12] They bend.

Komrska: [00:48:13] It is similar to the Fresnel biprism in optics. And here (in the region M_1M_2) you see interference fringes.

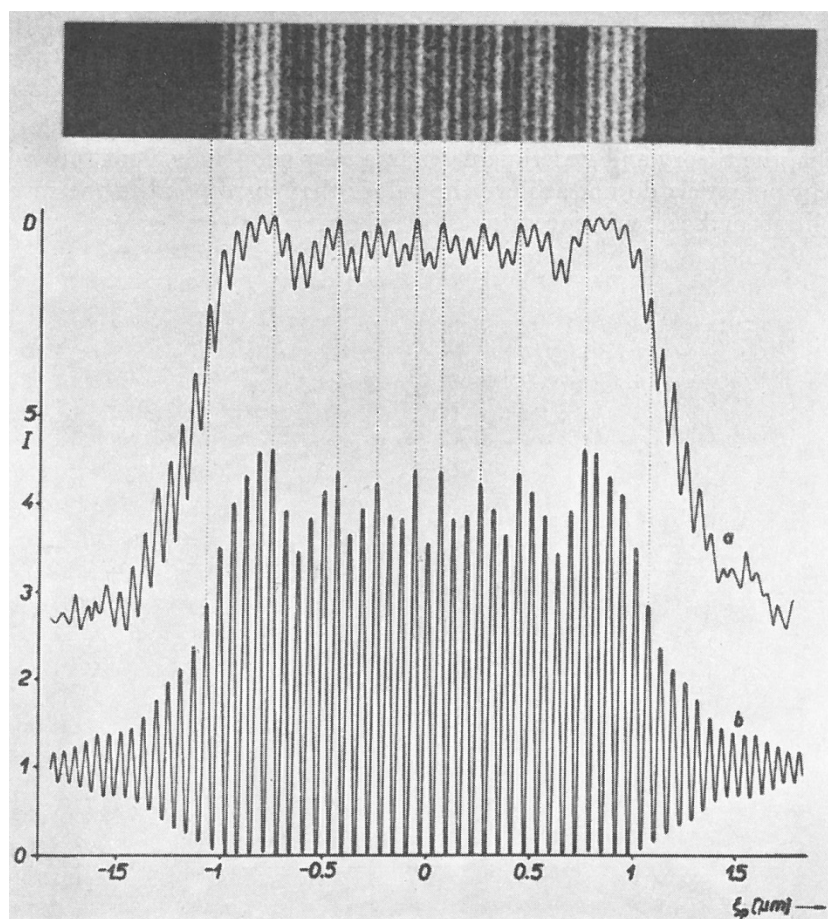


Figure 2. Electron interference pattern obtained by the Möllenstedt-Düker biprism. Photometric record (a) and calculated (b) intensity distribution.

Burnett: [00:48:26] Okay, so you can see the distortion. It's a distortion.

Komrska: [00:48:30] No. There are interference fringes and interference is the proof that electrons are waves. And in this book, Max v. Laue considers this a decisive experiment proving the wave character of electrons. So I was amused by that. Here it is. Much better.

Burnett: [00:49:05] This is the insertion of wave mechanics into solid-state physics?

Komrska: [00:49:20] No. It has nothing to do with solid-state physics, just fields and electrons. Nothing, no material. When I was here, already in Brno, in the Institute of Instrument Technology, Armin Delong and Vladimír Drahoš, mainly Drahoš, repeated this Möllenstedt experiment, and I noticed that the interference fringes are not of the same intensity. And so I was anxious to explain the effect. But I did not know quantum mechanics either. And at that time, I started to study the *Œuvres complètes* of Fresnel and *Optics* by Robert Wood, these old books, and that gave me a working knowledge of how to interpret the phenomenon. At first I did it with a model, a very simple optical model that the interference may be considered as the superposition of two Fresnel diffraction phenomena by halfplanes which are overlapped just by the width of the biprism wire. And when I had done it, I was amused by how perfectly every detail corresponded between theory and experiment. Look here. You see, here is the experiment (upper curve) and here (lower curve) is theory, and you see that the central fringe is weaker, and you

can follow mutual intensities of the fringes. The agreement is absolutely perfect. And this was my physics work.

Burnett: [00:51:37] And so there's a satisfaction that theory is confirmed or disproven—

Komrska: [00:51:45] —by a very naïve model, and Černohorský helped me enormously because when I got the idea how to interpret it, he hired ten students and we calculated it with calculators. We had no computers at that time, you know?

Burnett: [00:52:09] Oh my goodness.

Komrska: [00:52:10] It took three months or so to calculate several interference patterns on such machines, point by point!

Burnett: [00:52:18] Oh my goodness. For our audience today and in the future, it's important to understand how time-consuming calculations were.

Komrska: [00:52:30] Now, it would take maybe three minutes, and most of that time would be absorbed by printing.

Burnett: [00:52:45] Yes, yes. It's astonishing.

Komrska: [00:52:50] It was a naïve model, but it was successful and I was happy and sure that I could get a scientific degree.

Burnett: [00:53:06] And so you knew then, "I will be a scientist."

Komrska: [00:53:13] Yes. But one of the students, Michal Lenc, was a very talented theoretical physicist. And he suggested that we should interpret it in a quantum-mechanical way, and that the potential at the biprism wire may be understood as a perturbation in the quasi-classical approximation and so on. And then it was my idea to calculate the wave function, here, in the plane of the biprism wire by the quasi-classical approximation, and from there to calculate the wave function in the plane of observation by means of the diffraction integral. And we got the same numerical results as with the optical model. And then with B. Vlachová, now Professor Lencová, we have shown that the mathematical formulation of both ways of interpretation is the same. So, for me it was a miracle that it worked, you know?

Burnett: [00:54:33] And so you are 29?

Komrska: [00:54:37] Twenty-eight to thirty-three.

Burnett: [00:54:38] Twenty-eight, and it's the satisfaction. You were satisfied.

Komrska: [00:54:45] [Chuckling] From today's point of view it is a little detail.

Burnett: [00:54:48] No. Not at all. You're describing a moment of wonder, that you conducted an experiment that had that confirmed the theory perfectly, not approximately, but perfectly. And then your students used a wave-mechanical framework to confirm, again.

Komrska: [00:55:16] Yes.

Burnett: [00:55:17] And so it was the solidity of the relationship between theoretical and experimental physics, and it's a joy. It's a satisfaction for you.

Komrska: [00:55:30] Yes, it was. I had a good position because all the people who designed microscopes and did the experiments were electrical engineers. There were no physicists. And, at that time, I was the only physicist in the group, you know, and there was mainly Professor Drahoš who gave me a place to work. He was very patient. He gave me time for any work I wanted to do, you know. It was wonderful, wonderful.

Burnett: [00:56:09] So you achieved the *Candidatus Scientiarum*—

Komrska: [00:56:09] —in '65.

Burnett: [00:56:15] 1965.

Komrska: [00:56:17] It is like the PhD or something. Yes.

Burnett: [00:56:20] And it's part of Masaryk University, basically the Faculty of Natural Science.

Komrska: [00:56:28] Because the Academy [Czechoslovak Academy of Sciences] could not grant the degree.

Burnett: [00:56:34] And the following year, you are granted the *Rerum Naturalium Doctor*.

Komrska: [00:56:40] Yes, it was again an administrative change in the school system. Originally—I can show you—I was “promovaný fysik” or something like that. And then, if you were candidate of science, you've got immediately the doctorate.

Burnett: [00:57:08] So you were then at the Institute of Scientific Instruments.

Komrska: [00:57:13] Instruments. Yes.

Burnett: [00:57:15] Now when is the Institute established? What year?

Komrska: [00:57:20] The Institute was established in 1957. It was created by merging three smaller laboratories formed earlier. They originally arose from the post-war activity of Professor Aleš Bláha. He was a very talented technician and educator and he inspired a group of students to make electron microscopes, and also other students were inspired to do some high-frequency spectroscopy. So, the Institute of Instrument Technology had three departments, electron optics, infrared spectroscopy and nuclear magnetic resonance. Zdeněk Buřival was the first director.

Burnett: [00:58:30] And so this is a Soviet model of Institute?

Komrska: [00:58:35] The whole Academy was done with a Soviet model.

Burnett: [00:58:41] And I understand that, today, Brno is a center for the production of electron microscopes. Is that true?

Komrska: [00:58:52] Yes. It is said that one third of the world production of electron microscopes is from Brno, and there is a very talented engineer and businessmen, Jaroslav Klíma, who owns the Tescan factory and produces microscopes. It is a very successful firm.

Burnett: [00:59:23] Jaroslav—

Komrska: [00:59:25] Klíma.

Burnett: [00:59:38] So, you were participating and at the beginning—

Komrska: [00:59:43] No. You know, I was always a physicist. I was not active in these practical realizations of this. I was a “chamber” physicist, just mathematics, and calculations and so on.

Burnett: [01:00:03] But you were part of a group of electrical engineers.

Komrska: [01:00:08] Yes, of the group of Professor Drahoš.

Burnett: [01:00:08] And those electrical engineers, did they contribute to the future of electron microscopy?

Komrska: [01:00:16] In Brno? Yes. Yes.

Burnett: [01:00:19] So you *were* a part of it. [laughter] Interesting. Interesting. And this story is about the Möllenstedt–Düker experiment with the interference of electrons. And you refined and were very able to develop very precise measurements and different ways of justifying the relationship between the experimental data and the theory, really strong confirmation.

Komrska: [01:00:52] But then, after ‘68, there were again changes, and then I was asked to examine the quality of electron-microscope pictures by light diffraction, by Fraunhofer diffraction. And at the time there was not coherent optics, so I intended to do it with the thallium discharge lamp.

Burnett: [01:01:28] Okay, a thallium lamp?

Komrska: [01:01:29] Thallium is the atmosphere in the lamp and it has only a single spectral line in the visible region. But then I understood that it is now modern time; I must do it with lasers.

Burnett: [01:01:49] What year was that?

Komrska: [01:01:50] Sorry.

Burnett: [01:01:51] What year was that, roughly?

Komrska: [01:01:53] Seventy-two. Yes. And you know our optics was not done for coherent light, and I was afraid that there would be artifacts. Therefore I tried to work without optics at great distances with these lasers, and I got nice pictures. And to be sure that my results were okay, I studied the Fourier-transform formalism in detail and tried to illustrate all the statements of the mathematical theory by diffraction patterns. And it was a nice work because it is like *Orbis Pictus*, you know? Every phenomenon, every trivial mathematical theorem, has nontrivial physical consequences. For example, linearity. The Fourier transform, which is a linear operation, has as a consequence the Babinet principle, which means that if you have complementary screens, their diffraction patterns are in fact the same.

Burnett: [01:03:43] Okay. And it's not true?

Komrska: [01:03:45] It is true. It is a physical consequence of linearity and it was known since 1830. Mathematically, it is an absolute reality because of the linearity of the operation. A lot of such things, so-called Friedel law, that, if the specimen has a real transmission function then the Fraunhofer diffraction pattern should have central symmetry, i.e. even-fold symmetry. Again, mathematically trivial, but experimentally, very important. And there are tens of such examples. For example, I used to say I can distinguish between infinity and infinity plus one. Look. I hope I have it here. Specimen with 48-fold symmetry (which is almost infinity) gives the Fraunhofer diffraction pattern with 48-fold symmetry, whereas specimen with 49-fold symmetry (which is infinity plus one) gives 98-fold symmetrical diffraction pattern.

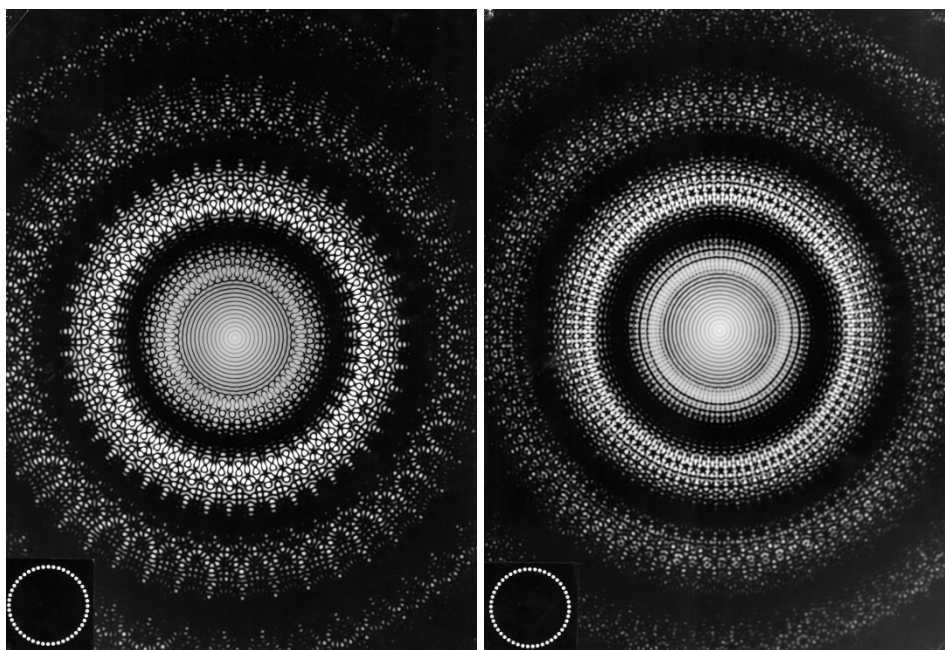


Figure 3. Fraunhofer diffraction patterns by specimens with 48- and 49-fold symmetry. The specimens are small circular openings distributed along a larger circle.

Burnett: [01:04:47] So Fourier transforms are very important. And it's a mathematical way of translating space or time into frequency and back again.

Komrska: [01:05:06] Yes, yes.

Burnett: [01:05:07] Right. And which is very useful because your detecting instrument is electronic.

Komrska: [01:05:11] Pedagogically it is very interesting to explain what is the frequency in two dimensions in optics, in three dimensions with crystallography.

Burnett: [01:05:21] Right.

Komrska: [01:05:22] Yes, but you are right. It is an inversion of the world: what is small in the real world is large or great in the Fourier space, and vice versa, so it is most suitable for structure analysis.

Burnett: [01:05:46] It's a very powerful thing that governs our world, and so in imaging for crystallography, it's to get very small things that you can't see with the naked eye. And in our digital world, we use Fourier transforms for pictures and sound, and the natural world is transformed into electronic or digital form and then back again. So that's a powerful aspect of scientific research.

Komrska: [01:06:15] Moreover, the patterns often are aesthetically beautiful. It was really very nice and gratifying work. It was interesting for students, from secondary-school students up to university professors. I had lectures in Halle and in Warsaw about that. It was really nice. But all the patterns were photographed, not registered digitally. It was done between 1973-1980.

Burnett: [01:06:42] Yes. And speaking of, or did you want to show me something?

Komrska: [01:06:48] Yes. I wanted to show you, but I have not brought it probably.

Burnett: [01:06:54] It's okay. Part of a scientist's practice is to travel, with the mind doing research, but also to travel physically to other institutions to participate in other research. And you had an opportunity to go to Birmingham, to the University of Aston in 1968. That was the year of the Prague Spring.

Komrska: [01:07:30] Therefore, it was possible.

Burnett: [01:07:33] Okay. So it was a period of openness and reform.

Komrska: [01:07:36] It was closed immediately in '69 or '70. Then I could travel only to Warsaw, Halle, just to the neighboring "socialist" countries.

Burnett: [01:07:44] Okay, so, so in 1968 you were able to travel outside of the Iron Curtain and you went to Birmingham, and was that a good experience for you? Did you learn new things at Aston?

Komrska: [01:08:01] No, I was invited there to lecture about applications of diffraction theory, scalar diffraction theory, in electron optics.

Burnett: [01:08:12] Okay, so you were teaching them?

Komrska: [01:08:14] Yes, MS [Master of Science] students. I was teaching there and, of course, discussing things with Tom Mulvey all the time, and my duty was to leave the text of my lectures there. In this way this booklet was published later in America.

Burnett: [01:08:33] Okay. I see this. [Cover of publication shown on video]

Burnett: [01:08:36] *Scalar Diffraction Theory in Electron Optics*. It was published by the academic press, so we'll get a still of this later, but I just want to—my manual focus is off. Let me get my autofocus on here. [Published in *Advances in Electronics and Electron Physics*, Vol.30, (NY: Academic Press, 1971) 139-234.]

Burnett: [01:08:57] It should focus there. There we go. All right. So your research was received outside of Czechoslovakia. It was, considered to be important and it was translated into English.

Komrska: [01:09:28] No, Mulvey was interested in our work.

Burnett: [01:09:33] What's his name?

Komrska: [01:09:34] Professor Tom Mulvey. He often visited us in Brno and his visits were very encouraging in our isolation. He was very kind man.

Burnett: [01:09:46] The Iron Curtain is more restrictive, so in the 1970s, you were going to Halle in East Germany.

Komrska: [01:10:07] There was an institute of electron microscopy planned for the whole Eastern bloc: Polish people, Hungarians, and so on.

Burnett: [01:10:25] Okay. And it was a through Max Planck, wasn't it, the Max Planck Institute?

Komrska: [01:10:31] No, the Max Planck Institutes were in West Germany.

Burnett: [01:10:34] But they, okay. And so it was incorporated later into the Max Planck institute. So that was an important recognition of your discoveries and your talents.

Komrska: [01:10:56] As I said, it was not science; the Fraunhofer diffraction patterns were just illustrations of the Fourier transform theorems, but it was a pleasure for me to do it.

Burnett: [01:11:05] Well, it has pedagogical value.

Komrska: [01:11:07] The pedagogical value is enormous. Yes. It fascinates everyone if it is well presented, so it is nice.

Burnett: [01:11:18] And you were publishing in *Optica Acta*, which is now, today, the *Journal of Modern Optics*. So these are the journals of record—that's what we say in English—the number one journals for the kind of work that you are doing. So you had an international profile.

Komrska: [01:11:41] Oh, no. But the review paper on diffraction in electron optics has probably most citations, around 60 citations or so.

Burnett: [01:11:50] Right. So, teaching is important to you?

Komrska: [01:11:53] Yes. You know, it was a sad situation in 1989 when the political changes came. We were all glad that there were changes, but it happens that—it was maybe March in '90 when I was asked by the director of the Institute—it was Professor Delong—to apply for the position of the director. And after some hesitation, I agreed, but then I recognized that he did not tell me that there was an active secret firm, a private firm in this Institute, Delong Instruments was the firm. And the former management of the Institute was prepared for political changes, economically prepared, and they were probably looking for a naïve person who would be a director and cover it up.

Burnett: [01:13:22] Oh my goodness!

Komrska: [01:13:25] So I was very sad and very angry, and as a director I had forbidden all such activities, but I did not have the explicit support of colleagues. Mostly, the colleagues secretly or privately supported me, but explicit support was not strong or sufficient enough. And I had problems with blood pressure and so on, an otherwise healthy man. I become to be very thin and so.

Burnett: [01:14:07] It was stressful.

Komrska: [01:14:09] I was disgusted totally by the fact, you know, because they all were friends of mine, very kind people.

Burnett: [01:14:22] So, so you were put in the position of the director, but you did not have the authority.

Komrska: [01:14:30] Yes. You know, the administrative apparatus, the secretariate, was related to the old management. I had nothing.

Burnett: [01:14:40] Right.

Komrska: [01:14:41] And then Professor Delong himself, he was a vice-premier of the federal Czechoslovak government. And so, really, the private firm tried to be active inside the Institute.

Burnett: [01:15:07] And today it is a company, Delong Instruments.

Komrska: [01:15:10] Yes.

Burnett: [01:15:11] Okay. Okay. Wow.

Komrska: [01:15:17] When I saw it, I resigned from the position of director and fortunately, at the Brno Technical University, Professors Miroslav Liška and Ivan Šantavý, started with physical engineering and were looking for a lecturer in Fourier optics, and I thought, well, it is a place for me because it is in the Faculty of Mechanical

Engineering and I can contribute to the teaching of structure analysis to metallurgists, of diffraction to opticians, and so on. So I applied for the position and then I was habilitated [no equivalent in English, but basically means credentialed for teaching] at the Masaryk University and two years later became a professor at the Technical University.

Burnett: [01:16:19] So in 1991 you are, that's this habilitation. You're an assistant professor, the faculty of natural science at Masaryk University, Brno in physics of condensed materials. And then in 1993 you are made professor in the faculty of—it was mechanical engineering—but it's now physical engineering. When is that made an Institute or—?

Komrska: [01:16:46] What it is now?

Burnett: [01:16:49] What it is now, yes, when did it become that?

Komrska: [01:16:51] It is the Institute of Physical Engineering in frames of the Faculty of Mechanical Engineering. It was a positive surprise for me. Originally, I thought it would be mainly optics. But there were three departments: optics, surface physics, and acoustics. This surface physics—nanotechnology—was so successful that it dominated. So the Institute of Physical Engineering has now three departments: (i) optics and precise mechanics, (ii) solid state physics and surfaces, and (iii) micromechanics of materials and engineering acoustics. Professor Tomáš Šikola is now the director. A former student of mine, now professor Radim Chmelík, is my nearest boss at present. He is doing confocal-holographic microscopy and it is nice physics work, and also a lot of engineering is in the design of the microscopes. It is a tendency, at the Faculty of Mechanical Engineering, that also mathematical methods for engineering are developed: finite-element methods, and such things.

Burnett: [01:18:25] At Berkeley, it's also located in mechanical engineering. It's called engineering science, and engineering science is theory. It's the theory of these kinds of applications. I don't mean to go back too far, but I want to be clear in understanding your frustration with the discovery of this company-to-be, this future company that was inside. So the problem was that this Delong Instruments, they saw that Czechoslovakia would become a free, and a free-market, society.

Komrska: [01:19:21] Yes.

Burnett: [01:19:2] And they were preparing, “Okay, we see this is coming and we are taking the resources of the Czech people”—and it's a public institute—“and we're taking these resources to make this company.”

Komrska: [01:19:48] Well, I perceived it so.

Burnett: [01:19:49] Okay, so that was the frustration for you.

Komrska: [01:19:52] It was a terrible frustration. But they all were more or less friends. I had friendly relations with them—I wonder what people can do for a million crowns [Czech Koruna].

Burnett: [01:20:11] Welcome to capitalism.

Komrska: [01:20:20] I was taught by this that I am absolutely not a useful person for any administration and management work, that I must do just a modest science with papers and pen. That's all.

Burnett: [01:20:42] Or, that perhaps you were too useful in administration.

Komrska: [01:20:46] [laughs]

Burnett: [01:20:52] They wanted someone who was less useful and you were not the right person. So, happily, you returned to teaching, to scientific research.

Komrska: [01:21:05] There are very nice personal relations here at the Technical University. Now, my chief, my colleagues are in fact my former students. It's absolutely wonderful.

Burnett: [01:21:25] That is very wonderful when your students achieve great things, but you are a mentor to others as well, to this day.

Komrska: [01:21:37] A lot of students are in the firm by Jaroslav Klíma: Tescan. And another firm, Thermo Fischer, is here. The production of electron microscopes is now done by a part by our students.

Burnett: [01:22:00] And Tescan, did that come out of—which university?

Komrska: [01:22:08] Tescan, please, just from my head, you know, J. Klíma was an employee in Tesla. Tesla in Brno was a producer of microscopes during the totalitarian period, and of nuclear magnetic resonance apparatuses.

Burnett: [01:22:33] During the Czech communist period?

Komrska: [01:22:36] Yes, I don't know exactly, from '60 to '90. And J. Klíma was one of the workers there, and I remember, he designed a very successful scanning electron microscope, a small one, but very nice. And then I lost him from my horizon. I understand he has a great firm now.

Burnett: [01:23:11] He was not a student of yours?

Komrska: [01:23:13] No, no. He was, as far as I know, an electrical engineer, not a physicist. But he employs a lot of physicists now. Including Professor Bohumila Lencová.

Burnett: [01:23:29] In telling the story of Delong Instruments, you described one of the changes that took place between the communist period and the Czech Republic period. So you arrive in '91 at the Technical University of Brno. Can you talk about the evolution of research at the Technical University in the 1990s and the 2000s?

Komrska: [01:24:06] Yes. There is a great freedom for students. They may change the course of their studies and so on.

Burnett: [01:24:26] So that means that, before, you had to be directed—?

Komrska: [01:24:32] I am in contact with a very small group of students. The faculty has 800 students in one year, and from them I am in contact with some 20 or 25. But this nanotechnology is very attractive for students, and so talented students come to our department to study nanotechnology, and they are really very clever and very talented. But what Černohorský admires is that students are now from the very beginning in contact with very expensive and advanced instruments. When I was the beginner in the Academy, we had to study several months or even years just with books and papers, and only then we got a simple instrument, and now it is the opposite. Unprepared students get advanced instruments.[laughter]

Burnett: [01:25:59] Well, in the 1990s, there was a period of adjustment of moving from a socialist, quasi-market society to a market society open to Europe, and so can you talk about that change or those challenges? Was there more communication with other countries? Investments, was there investment of money into the Czech Republic?

Komrska: [01:26:41] I do not understand these money things and I am not interested in them. But what is evident is this open society—a lot of scientists from abroad came here, and our students spend half a year, one semester, in western universities. You know, it is almost a duty.

Burnett: [01:27:18] Almost a requirement that they do this.

Komrska: [01:27:22] And so they come into contact with professors and students in Spain, in England, in Germany, in Austria, and from Vienna, a professor was here. At the Masaryk University, there is a Swedish-origin professor, Rikard von Unge, and from Austria the physicists are here, which was impossible in the past.

Burnett: [01:27:57] Right.

Komrska: [01:27:57] So it is very open. But from the economical point of view, I do not follow it and I'm not interested in it. [laughs]

Burnett: [01:28:07] Well, I can imagine, historically, before World War II, the connection between Brno and Vienna was very strong.

Komrska: [01:28:23] Yes. It was. Gödel, Placzek.

Burnett: [01:28:25] Well, Georg Placzek, for example.

Komrska: [01:28:30] Not only Placzek, but these mathematicians.

Burnett: [01:28:35] Sure. Well, Ernst Mach, and all of these physicists. So Vienna was a world center for science at that time. And Brno was, for people who don't know, a train connection to Brno from Vienna. It's one hour and 20 minutes. So it's like a suburb in some ways.

Komrska: [01:28:58] Yes, a suburb, in some ways.

Burnett: [01:29:01] So that connection, it's restored after the 1990 period.

Komrska: [01:29:12] Yes. Absolutely. Immediately, I was invited to Vienna in '90 by Professor Anton Zeilinger.

Burnett: [01:29:27] Can you tell me, when did you know that the change was coming? When did you know?

Komrska: [01:29:39] Well, to be sincere—I never believed that I would live in the free world. Even when the demonstrations started, I did not expect that it would be completely successful, because jets were flying and everything. They had the power in their hands, so I did not believe—I took it as Osman's empire, you know? It will be kept and somehow it will end, but not during my life.

Burnett: [01:30:29] Oh, like the Ottoman Empire or the, the Habsburgs or something—

Komrska: [01:30:34] Yes, yes.

Burnett: [01:30:34] So 400 years or something like that. Also, I suppose you had the experience of '68 when in the 1960s it was a period of reform. And, so, before '68 what was your appreciation of the reform movement? Did you feel like things would be more open?

Komrska: [01:31:02] Yes. For me, it was absolutely impossible to go to Vienna before '68, absolutely impossible. I looked to the Vienna roofs from here. It was impossible. Absolutely. In '68 it was all of the sudden, you can go to Vienna, but it stopped in '70 for me, absolutely. It stopped immediately, then it came to be more free at the end, in '88 and '89 already, and suddenly it collapsed, from a day to a day, you can go. And in Vienna, the inhabitants were very kind. They invited us to go to Vienna. We had free tickets for trams. It was very nice, really.

Burnett: [01:32:22] And so, you were not sure in '89 if this was permanent?

Komrska: [01:32:34] Yes, but it was a question of days. At the very beginning, I was afraid that there would be some economical changes only, like Glasnost in Russia with Mikhail Gorbachev, and that it would be more free, but not too much. But after two or three weeks, it was clear that it was the end of the communist area, but still people were afraid because the Soviet Union existed at the time. But then it collapsed too, so it was ok.

Burnett: [01:33:16] So once the Soviet Union collapsed, that was the power that determined the fate of Czechoslovakia, now the Czech Republic.

Komrska: [01:33:28] That is what I admire at some humanistic educated people, that they understood and were sure that the end should come soon. I had not seen any reason why the communists should concede freedom here and lose their power. Economics was wrong, but the army and police was firmly in their hands.

Burnett: [01:33:59] It was not obvious.

Komrska: [01:34:01] For me it was not obvious, no.

Burnett: [01:34:04] True. So things change. There's more communication between countries—

Komrska: [01:34:14] It's incomparable.— You may type a question in the computer and you get an answer within minutes.

Burnett: [01:34:21] Well, this is the other change, right? There are two big changes after '89 and '91. One is 2003, the [entry into the] European Union, and the other is the Internet. So can you talk about those changes? As a consequence of the engagement with the European Union, is there European scientific investment or participation in Czech science?

Komrska: [01:35:03] Yes. I do not see the details as you know, but there are scholarships for students, everything paid by the Union or by some institutions in the Union. This is a great change and a great support. You know, I remember it was in '64, there was a Congress, the European Congress on Electron Microscopy in Prague. And I met there professor [Elmar] Zeitler and we had a discussion, interesting, and then, some three or four weeks later, a letter from him came to the Academy in Brno and Černohorský brought me the letter. And the letterhead was "Department of Defense, US Army Institute of Pathology." [Zeitler was in the Biophysical Department at Walter Reed Army Medical Center until 1968, where he went on to the University of Chicago and the Max Planck Institute.] So, it was an institute of the US Army. And there was a note from Zeitler: "Thank you for the discussion," followed by formulas and numbers and Černohorský said, "Do you understand that such a letter will cause a mark on the secret police?" [laughter]

Burnett: [01:36:30] That's it. Well, that's interesting because I interviewed a Korean X-ray crystallographer who was studying at the university of Pittsburgh in 1959, 1960, and he talked about the new direct method that came out of the US Navy laboratory. So US military research was very interested in crystallography at that time. [laughter] So, your research was interesting to them?

Komrska: [01:37:12] No, no. There's nothing to do with the army. Just he was employed at the Institute, and so the letterhead was like that. It was related to the scattering of electrons, maybe this Möllenstedt experiment. I do not already know what it was. [laughter]

Burnett: [01:37:40] But there was much contact. The Cold War was also some scientific diplomacy, so US scientists and Soviet scientists would meet at these congresses. It was friendly, but it was also observation. [laughter]

Komrska: [01:38:05] I remember when there were visitors from the Soviet Union, for example, and a demonstration was done in a dark room. And then you can recognize who is scientist and who is the observer, because, after few minutes, the scientists were acquainted with dark rooms, darkness and so on, but the politicians or policemen or whoever they were, they were yawning.

Burnett: [01:38:47] They were yawning? Oh, they were sleeping? They were asleep because they were not interested in the science.

Komrska: [01:38:56] And it was dark and it was a reflex. Being an electron microscopist at that time you spend lot of time in the dark room so you are accustomed to darkness. So you could distinguish immediately who is who.

Burnett: [01:39:11] So there were observers making sure, because—to be a scientist—physicists were among the only people who could travel to the West, right? Not many people in Czechoslovakia could travel to the West, because you were ambassadors of science. You were going to the West, but it was a danger. It was a risk. Did you, did you ever think to leave? For example, in Birmingham, did you think that you might stay?

Komrska: [01:39:57] Yes, I would like to have done it, but for the family reasons, I have never done it. You know, it is funny. I wondered, “Father, with such a Munich Agreement in ‘38 how, why you are here, why?” But then it was ‘48, again, no emigration. And now in ‘68, I understood why I did not emigrate. I was in Birmingham and I got the offer to go to New Zealand, you know, and my wife did not want to go, and it would be also complicated for my relatives here, sister, and—

Burnett: [01:40:54] So there could be punishment or retribution against the family?

Komrska: [01:40:58] Yes. That is why I never thought really about emigration, just the problems with relatives who are here.

Burnett: [01:41:11] That was the “incentive,” let’s say. Right. So these are happier times now that students can travel all over the world. There’s European funding and Czech funding as well.

Komrska: [01:41:39] [pause in audio] Ernst Abbe used in his lectures in Jena in 1880 a transform, which enabled him to evaluate the double integral describing the Fraunhofer diffraction by an opening in a black screen by a line integral along the boundary of the opening. So, the dimension of integration is lower. But Abbe never published it. And it was a student of him named Rudolf Straubel, and he published it in his thesis work in 1888. And it was forgotten. After half a century Max von Laue rediscovered it in 1936, and he also found consequences for crystallography. From this Abbe transform, it follows that to every straight part of the boundary of the opening there must be an arm of the intensity in the diffraction pattern perpendicular to the straight part. And this is known now as the Abbe Theorem. It explains why the Fraunhofer diffraction patterns often have a star-shaped exterior and why star-shaped spots appear in TV images.

It is interesting that the Abbe transform enables us to express algebraically the double integrals standing for the Fourier transform of characteristic function of polygons and even the triple integrals corresponding to the characteristic function of polyhedra. I did it—a hundred years after Abbe and fifty after von Laue. It really simplifies calculations: You may get the intensity distribution in the Fraunhofer diffraction by polygonal apertures without any integration. Or if you want to understand the shapes of the HEED spots by small crystals you easily evaluate the triple integrals.³

³ Komrska J., "Simple derivation of formulas for Fraunhofer diffraction at polygonal apertures." *Journ. Opt. Soc. Am.* 72 (1982): 1382-1384; Komrska J., "Algebraic expressions of shape amplitudes of polygons and polyhedra." *Optik* 80 (1988): 171-183.)

You may meet with a charming dilemma when you calculate the Fraunhofer diffraction by an aperture the boundary of which possesses along the same straight line two parts of the same length but of opposite orientation. Then from one point of view the diffraction pattern must have a bright arm in the perpendicular direction, whereas from other point of view it must be zero intensity in that direction. And one may wonder how nature will solve it. And nature yields the solution. The arm of bright intensity exists, but it is driven by a dark line.

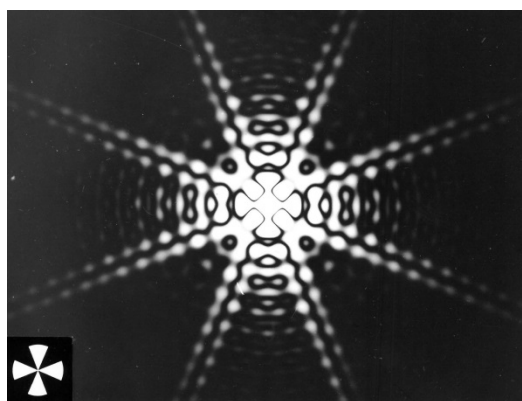


Figure 4. Fraunhofer diffraction pattern by the four-fold sector star with arms of intensity split by dark lines.

Burnett: [01:46:10] We were talking off camera and you were showing me some of the diffraction patterns. And I loved what you said about it because the law was: along one axis the energy is zero and on the other axis there is this maximum amount of energy. And there was a situation where you said, well, “There is an energy reading that is zero.” And you said, “How will nature explain this?” Which I found really interesting, that you are reading nature and you were asking nature for an explanation, which I found a really beautiful way to describe what you do. You are in a conversation with nature.

Komrska: [01:47:13] —with nature, yes. But you know, these are such details from the whole science—

Burnett: [01:47:21] Certainly, but the details are the secrets of nature. They reveal the precision, the symmetry, the patterns. And that’s something that is delightful for you, I think.

Komrska: [01:47:39] Another thing which is pedagogically interesting is this one. If you have a crystal lattice— in crystallography we also use reciprocal lattices. [Reciprocal coordinates were invented by Gibbs in America, also in 1880.] And now, this reciprocal lattice, usually defined algebraically, is in fact the Fourier transform of a crystal lattice, and it is known. Everyone uses it, but very seldom, probably only in Guinier, there is a notion about the proof. You can’t find the proof that the reciprocal lattice is the Fourier transform of the crystal lattice. And so, our students must know how to prove it, exactly to prove this fact.

Burnett: [01:48:49] Let’s talk for a moment then, just to conclude, perhaps. Do you have some advice or a statement to make to the students in the Czech Republic today? As young scientists going into the future, what would you say to them?

Komrska: [01:49:11] Well, you know, I've had a lot of very good students. But now I am old and for them it is much less attractive to work with me, so my students—

Burnett: [01:49:33] —or the students of your students.

Komrska: [01:49:35] So sometimes somebody comes and ask me to help with a calculation or to give some hints and so on. But now, in fact, I have no students. But, it's understandable. I am eighty-three.

Burnett: [01:50:07] I think for your background, your education, the way that you learn—of course, technology has changed how people learn; we have the Internet; we have new pedagogical methods—but you have experience and you have a long experience. I'm wondering if there's anything you would like to say about physics, about learning in general?

Komrska: [01:50:38] There are very serious pedagogical questions which, fortunately, have already nothing to do with me, you know? But for example, I, as a student, spent many months training integration. If you differentiate a function, normally there is no problem, shouldn't be a problem, but integration, you must have good training. But now you have tables and the Internet. You find the results immediately. You need not know the methods how to integrate. It's the same with ordinary differential equations. We had a two-semester course. Now, students mostly solve it digitally by computer. The question is whether it is obligatory to teach these things. Special functions. There is a vast literature about special functions. It's ten thousand publications about Bessel functions and so on. But now, it is not taught. The students have no experience with Bessel functions.

And the question is, should I force them to study it or not? So I do a compromise. I tell them: You should be opticians. Optics has mostly cylindrical symmetry and for cylindrical symmetry, there are Bessel functions and here is an appendix. You have in it a treatment of Bessel functions, and that is all about Bessel functions that I have used during my life. And it is up to you how much you will learn it or not. But you should solve these problems.

Burnett: [01:53:01] If you could determine the curriculum in physics for anybody, for the Czech Republic, would you add one year of study of integration or the study of functions to actually calculate an integration?

Komrska: [01:53:26] In fact, I do not know. I have several grandsons and one of them studies computers. He's talented. He can solve the problems, but he does not know the theorems and the proofs and so on. And, to my surprise, he is not interested in it, he does not appreciate the beauty of it. So I don't know. I like it, you know? but I will not force students of applied science to do it.

Burnett: [01:54:27] But, because so much of your learning was, was an autodidactic process—you taught yourself—you had to engage with the mathematics in a very fundamental way. And I suspect that there is a facility or an agility or a strength, a mental strength in being able to work with the fundamental aspects of the mathematics that can help with the higher-order calculation.

Komrska: [01:55:11] Hearing you, fundamental mathematics is something completely different. It is very basic logic.

Burnett: [01:55:25] Sure.

Komrska: [01:55:25] This is very applied mathematics.

Burnett: [01:55:27] Sure, sure. But there's a—

Komrska: [01:55:30] Somehow, I think the course of mathematics we had during our studies was excellent. It was analysis and infinitesimal calculus, analytical and differential geometry, algebra, functions of complex variables, partial differential equations. But now it is compressed to one or two semesters. Well, the future will show.

Burnett: [01:56:08] Sure. It's compressed. But this is the way it is now. But one thing that I think we can appreciate is that you appreciated the mentorship of Professor Černohorský and learning how to learn. That's the fundamental, I think. And you taught your students how to learn.

Komrska: [01:56:34] Yes. It was a very, very strong hint from Professor Černohorský. When I started with the work with the Möllenstedt experiment, I sometimes had problems. I did not understand something. So I went to Černohorský to consult about the problem, and of course he was not involved in it. So he was patiently listening to me. And then he said, "write it." And I was disappointed but sat down and tried to write it. And it was always helpful.

Burnett: [01:57:29] Yes, absolutely. That's a good technique.

Komrska: [01:57:33] So it was one of the mysteries of the Černohorský teaching: "Write it!"

Burnett: [01:57:41] Wonderful. Professor Komrska, I want to thank you for taking the time to speak with us about the history of Czech physics, the history of your life in science, and your wisdom in teaching and learning.

Komrska: [01:57:59] The pleasure was mine.

Dr. Ludvík Kunz

May 20, 2019



Dr. Ludvík Kunz



Dr. Kunz as student, 1965

Biography

Since 2012, Professor Kunz has been the Director of the Institute of Physics of Materials of the Academy of Sciences of the Czech Republic, the institute that Martin Černohorský helped establish in the 1950s. From 1994 until 2012, he led the Mechanical Properties Department of the Institute. He is also a researcher with the High Cycle Fatigue Group of the Institute. He studied with Professor Černohorský in the 1970s and pursued a career on the fatigue of materials.

Burnett: [00:00:00] This is Paul Burnett interviewing Dr. Ludvík Kunz for the Martin Černohorský/ Czech Physics project and it is May 20th, 2019 and this is our first session and we are here in Brno, Czech Republic. Welcome, Dr. Kunz. It's a pleasure to see you again.

Kunz: [00:00:45] Thank you for the invitation.

Burnett: [00:00:47] I want to begin at the beginning, so if you could tell me a little bit about where you were born, a little bit about your family, and your experiences growing up.

Kunz: [00:01:01] So, I was born in a small village near Brno, nearly 10 kilometers in the direction of Austerlitz [Slavkov], where the battle of the kings was many years ago. I visited the grammar school and I had a little bit of a complicated situation because my mother was a teacher of the Czech language at this school. And you can imagine that it is not easy for a child to have a mother in school. My mother was, I think, a very good teacher of the Czech language. And she was special, and I think it influenced also my career. She believed not in a God, so how is it called in English?

Burnett: [00:02:08] She was an atheist.

Kunz: [00:02:09] Yes, and it was a tradition in this family for many years that I didn't visit these lessons of religion. As a man, the majority of my colleagues until the fifth class [grade] studied such—

Burnett: [00:02:38] The catechism.

Kunz: [00:02:40] Yes exactly. It's difficult for me. Catechism. We were only three or four, we were not visiting —It was strange because it was during this communist era, nevertheless the majority of young children were present there. Because my mother, in the thirties of the last century, was driving a motorcycle, so she was really special, and I was influenced in this way: simply not to trust everything. But on the other hand, I was not favored in the communist system because my mother had problems. She was a really good teacher. And if somebody, some child was bad, so the number, how is this called?

Burnett: [00:03:24] The grade?

Kunz: [00:03:26] The grade. The grade was worse, so it was a son, for example, of some member of the Communist Party and that's why she had problems very early on, because she was correct, yes? And in our family, we discussed that, in the open air, we would speak in a little bit different way than at home. My father, on the other hand, was a man who started from a very poor, I would say, background.

And he was a musician. Later on, he was working in a Moravian museum as a researcher of folk music and folk habits. And, in the year '60, he was a chief of ethnographic museum department here in Brno. On Koblížná street, he restored an old building for this museum.

And he prepared here an outstanding exposition. This exposition described life in this country during the last five generations: agriculture, habits, music, everything. And this

was a really outstanding exposition, and he got the Herder Prize in the year '68. And it was naturally very complicated later because this Herder Prize was an award for people who tried to connect West and East in Europe. So from a political point of view in '67, '68, it was okay, but later on it was difficult. So my feeling from the beginning was that I should think about the world, not to trust everything that is simply said. And if you are interested, I can show you some photos here. It is from this Herder Prize award in Vienna—

Burnett: [00:05:53] In Vienna, a ceremony.

Kunz: [00:05:55] Yes. And this is from this ceremony. [shows photograph]

Burnett: [00:05:57] Oh, and that's your father?

Kunz: [00:05:59] No, he's not my father. My father is here. This is my father. It was at Vienna University.

Burnett: [00:06:10] I will take pictures of these and I can insert them.

Kunz: [00:06:13] My father also reconstructed this building on Kobližná street with Professor Fuchs, who was an outstanding architect of the world, well-known architect. And here is my father with him. So it means, that since the beginning, I was thinking about various things, and frankly speaking, I was interested to know what the world means and what physics means and so on.

Burnett: [00:06:45] Well, you, it sounds to me that your parents were either actual or potential intellectuals.

Kunz: [00:06:55] Definitely.

Burnett: [00:06:56] And that can cut both ways, as we say in English. It can be a benefit and it can be a strong liability, depending on the mood or the atmosphere of the ruling class, or the ruling party.

Kunz: [00:07:10] It was a background from which I was coming, yes.

Burnett: [00:07:15] And it was an academic background, but from the humanities. It was art, music, ethnomusicology, folklore—

Kunz: [00:07:24] Yes.

Burnett: [00:07:25] And your mother was a teacher, a teacher of languages. But there was a family respect for scholarship, intellectual pursuits that inspired you to continue or pursue your education. But you are also a child of the communist era. You were born in 1947.

Kunz: [00:07:56] Exactly.

Burnett: [00:07:58] And the coup is 1948, and so you grow up inside this world, so your parents and their friends, you grew up in an atmosphere in which there were two cultures. There was a private culture at home and a public culture.

Kunz: [00:08:19] Exactly. Yes.

Burnett: [00:08:21] Everyone experienced that? Everyone experienced this—

Kunz: [00:08:23] Difficult to say, you know, there were people who were trusting this new development because, can you imagine, during the Second World War? It was difficult, yes? The relations of Czechs to Germans are extremely complicated. There are good and bad. It is two thousand years of neighborhood [coexistence]. So, this was really complicated. Here in Brno, for example, many people have German origins. My name is Kunz, which means that my grandfather was also of German origin, speaking German. So, it is really a special situation here in Middle Europe.

Burnett: [00:09:09] Is there a suspicion or nationalist resentment if you have a name like Kunz?

Kunz: [00:09:18] No. No.

Burnett: [00:09:19] No, it's understood. Everyone knows that?

Kunz: [00:09:21] Understood, so my name is Kunz, like Novak, like—

Burnett: [00:09:28] Right. But there were forced repatriations of Germans from the Sudetenland into—not back to Germany; they were never in Germany. They had been living in the Czech area for centuries.

Kunz: [00:09:42] I just wanted to stress that here in this Middle Europe, the situation is extremely complicated and the connections among people very, very strong. People in Vienna, for example, many of them have Czech names. If you take an old telephone book of Vienna, you'd see half the names were Czech names, I would say.

Burnett: [00:10:07] Right, right. Well the communists, the Russians, were technically liberators. And at the end of the war, they were able to provide some services and they were liberators from the German occupation.

Kunz: [00:10:22] Exactly. So many people were of that opinion, that everything is good. They were liberators, and the world will be very nice.

Burnett: [00:10:35] Yeah.

Kunz: [00:10:36] But! Yes? But...

Burnett: [00:10:40] [laughter] Yes, well, we'll explore the "buts" a little bit. So in the 1960s you are, you would be described in English as part of the Baby Boom Generation. And the 60s are a period around the world of reform, and, in Czechoslovakia, it's no exception. And there's the [Alexander] Dubček regime, and there's all of this optimism around the reform.

Kunz: [00:11:08] There was big optimism at the time, definitely.

Burnett: [00:11:10] And you were 18 in 1965, right?

Kunz: [00:11:15] Yes.

Burnett: [00:11:16] And so can you tell me a little bit about—now you have this background of skepticism, I suppose—

Kunz: [00:11:26] It's difficult to say if it was skepticism or not. So, I was sure that I could not say some things which are not in line with our politics. Yes? On the other hand, our standard of living was not so bad. Yes? And we were at the time with our gardens, we have our friends and so on. So we were living; it was not so bad.

Burnett: [00:11:56] Yeah. There was a dream at that time of improving socialism.

Kunz: [00:12:04] Exactly, in these years, it was really very optimistic because we were able to travel abroad in these years. So, we were really of that idea that we could improve socialism, and now I know that it is impossible. I was in North Korea in the 80s, and it was for me an experience that [showed that] this development and this organization of society is impossible. Impossible.

Burnett: [00:12:43] Yeah, I think many Czech people discovered that after '68 and the Normalization, but in 1965, '64, you entered university, is that right? Can you talk about the gravitation to science. Can you talk about how this happened?

Kunz: [00:13:07] As I told you at the beginning, I was wondering how the world is organized and so on. And I had problems, because on one side I was interested in space and in physics and so on; on the other hand, I saw my father, who was extremely good in this area of folk arts and music, and I hesitated for a long time. And sometimes I discussed this with my father and he told me — it was after this Prize — “Ludvík, I think it would be not good to go in my way because I was relatively good in this area and people will say, yes, you are the son of Kunz and it is not good position,” and so I decided to study physics.

Burnett: [00:14:01] But it's something you were good at. In school, were you good at mathematics? Were you superior at mathematics?

Kunz: [00:14:13] No, definitely not. I started at *gymnasium*, middle school here in Brno, because, it was a time when we were simply sent to the nearest gymnasium. [Střední všeobecně vzdělávací škola, secondary general education school, one of several so named in Brno, on Tábořská street.] I was in Tábořská, and the level of this particular gymnasium, it was really low. So when I went then to the university, I had problems at the beginning because my class mates were coming from a special middle school which was focused on mathematics and physics. So I had at the beginning a big disadvantage. So I started to study very hard in the first year, and maybe thanks to this activity I remained in the school because it was really quite hard. We started, if I remember well, about 40, 45 in our group and by the end we were only 11 or something like that. So really many of us ended school because it was a really a hard job. And we had very good

teachers like Professor Černohorský and you have to be really good to go through exams. It was not easy.

Burnett: [00:15:35] It's the story of many students, especially in the United States. They come to university very underprepared because of where they come from and the schooling that they had. So, what were your strategies or techniques? How did you compensate for not having the preparation that the other students had?

Kunz: [00:16:03] Simply I learned everything that I had to learn.

Burnett: [00:16:08] You worked! [laughter]

Kunz: [00:16:10] I worked, yes, very hard. I asked my colleagues. I had two very good friends from this good gymnasium, which was focused on mathematics and physics, and they helped me. So after one year, it was much better.

Burnett: [00:16:27] So asking for help is important. Yes?

Kunz: [00:16:31] Yes, yes.

Burnett: [00:16:32] That's an important message I think in some of these careers. People I think assume, "Oh, they had a good education, a good background, a good advantage. And that's why—"

Kunz: [00:16:47] You must work hard. It is all.

Burnett: [00:16:51] Exactly. So you enter Masaryk University in the Faculty of Science. And it's in 1966, right in this period, so in the middle of your undergraduate training, you are a student and the Prague Spring happens. It's not in Brno, but there was probably a "Brno Spring" too.

Kunz: [00:17:19] It was the same. First of all, we were extremely surprised by what happened. In the beginning, we were not able to understand it, simply. How come? And for me it was very difficult because, just in these days, I was in Germany with my father and we hesitated if we should go back Czechoslovakia or to stay abroad. It was very problematic. So we even went home, then we again went to Austria because the border was free at that moment. You could move without any problems. And I even tried to continue at a university in Germany. I asked, if they were able to accept me, and if I could continue the study of physics. I explained to them that I was in the third year doing quantum physics and I showed them what I knew. They told me, yes, you can continue without any problem. So I was practically accepted but then I returned home because I was a little bit, in English it is difficult to say in. I was, in German, *Ansässig*.

Burnett: [00:18:49] You were worried, anxious?

Kunz: [00:18:53] I wanted simply to be at home, despite this danger. So then I returned home and I stayed in the Czech Republic.

Burnett: [00:19:02] And there are consequences to that.

Kunz: [00:19:05] It's difficult—it's completely different to people in America. In America, people are moving without any problems through the whole states. Yes? I think it is unbelievable for you that I am in my Institute 50 years, 50 years in one institute! I think it is something which is not so often the case in the States. Yes? Impossible, I would say.

Burnett: [00:19:30] Yes, and because moving is encouraged, to gain experience at multiple institutions.

Kunz: [00:19:36] Maybe it is a specific [characteristic] of this Middle-Europe area is that they don't like to move too much. It's difficult to say.

Burnett: [00:19:46] Well, during the period of Normalization, it ceases to be a choice, or not?

Kunz: [00:19:53] Many people went abroad, that's true. Okay. But, what about the ratio? Is it too much or, difficult to say.

Burnett: [00:20:07] Well, there were options. I guess the change that happens after '69-'70 is that the movement is within the [Eastern] Bloc, within the Warsaw Pact's reach. So you could study in East Germany, you could study in Poland, but not in West Germany so easily, or, well, I can pose this as a question. Physics was perhaps a special case. With physics, it was one area where there was more freedom than the average person or the average professional to study at institutions abroad. Is that true? Was physics a special case?

Kunz: [00:21:05] I don't think so, that physics was something special, some special discipline. During this free period, two, three years before the year '68, it was possible to go abroad if you had some contacts and to be in Western countries. Naturally, then, everything was stopped. And there were differences. For example, between the Czech and Moravian part and Slovakia. Slovakia, it was a little bit more free than in the Czech part, in Bohemia and Moravia. There are only small, really small differences, which we were feeling as inhabitants of this state.

Burnett: [00:21:59] Exactly. Exactly. So you are able to finish your undergraduate study in physics in 1970.

Kunz: [00:22:12] Yes, and then I was in military service for one year. It was necessary [mandatory] to be there. And, before I finished my studies, I cooperated with the Institute of Metallurgy, our Institute at the time, in student services, something like this. So I started there in the Czech as "*pomocná vědecká síla*," i.e., research assistant.

Burnett: [00:22:47] And that counted as military service?

Kunz: [00:22:50] That was before. During my third year at university, I had this contact with the Institute. And based on this, after I finished my school, I simply asked if it was possible to continue in the Institute. And it was possible, and I even have here a letter from Professor Černohorský, which I will show you.

Burnett: [00:23:16] Yes, sure. So you have just shown me the letter of acceptance from Professor Černohorský, which meant that you had already met with him or already knew him. Can you tell me how you met him? You took a class with him?

Kunz: [00:23:37] No class. I don't remember the details, but he was a member of a state examination [committee], and he put us very good questions and he wanted to hear very good answers. So he was very, very exacting. But I passed this exam and so I met him at this occasion. Nevertheless, he was also active in the Institute, and then because I wanted to study the things which happen on the tip of a crack, fatigue crack; residual stress is very interesting, and he was an expert in residual stress. So Professor Lukáš told me it would be good to cooperate with him and to simply develop method of measurement of stresses by means of roentgenography [X-rays]. And based on this we prepared this paper first by my first paper about residual stresses.

Burnett: [00:24:44] And what is—

Kunz: [00:24:47] Residual stresses? It means, if we have a plastic zone around the fatigue crack tip, there are stresses in this region. And to measure the stresses, you get some information about the behavior of the fatigue crack. And it was the start, as my first publication.

Burnett: [00:25:12] And this is a massive area in materials science and engineering: to understand, for very obvious reasons—and I will be obvious—because the materials we use come under tremendous strain and we want them to be perfect and not fail, because the lives of people are at stake. Buildings and vehicles and instruments are all made of materials and they come under stress of pressure and temperature changes. And, when they fail, they fail along these edges of the, of the crystal structures, and they break. And so you want to understand that fully. And this is this incredibly important region of study that you are interested in.

Kunz: [00:26:02] So I studied physics, theoretical physics and solid state physics. I moved towards these, I would say, engineering disciplines. And in those days, there were two groups in our Institute: one group were physicians and the other engineers. And professor Černohorský wanted to bring both groups together. It was not easy. But he was pushing us to, and I think it was really good basis for the next development because, this engineering approach cannot proceed further without understanding what happens in materials, what is causing dislocations and such things, and so from this point of view, his activity was very, very good for the Institute and for its orientation. And, to this day, we have two groups: one is more interested in modelling of solid materials from first principles—it is really theory—and we have engineers and materials scientists who are working on the second part, and we are pushing these two areas together.

Burnett: [00:27:14] Professor Černohorský was, very much I think, ahead of his time, because this is happening in American institutions, but later. Into the 1970s and the 1980s, there's this real emphasis on the removal of the distinction between applied engineering and theoretical physics because one informs the other.

Kunz: [00:27:50] Exactly.

Burnett: [00:27:52] But it took some time for those kinds of changes to take place. I think, it seems today very obvious, but these are institutions, and institutions are established in certain ways, and they were perpetuated in those ways. It's very difficult to change institutional structures, and so he was in a position on the margins. It's not on the margins, but you can describe it better than I can. He occupied a certain position in Czech physics that allowed him to experiment with institutional forms. Is that true, for example, could he have done this in Masaryk University?

Kunz: [00:28:39] At least in our Institute, he influenced it very seriously, at least in our Institute. It's difficult to say how it was in the whole state. I think that the behavior at Charles University or [Brno] Technical University was perhaps a little bit different. I can say something only about him and from this point of view, it was good because our Institute is, up to now a very good Institute, and the basis was good. So we grew from this foundation. So from this point of view, it was very good activity on his part.

Burnett: [00:29:21] We have talked in other interviews and with Professor Černohorský about Brno, that Brno is this important center for industrial technology and advanced techniques and physics. It's in the orbit of Vienna. It's in the orbit of the center of modern physics in the 20th century. So it has that. What I'm so curious about is there's this legacy and heritage of advanced research in advanced industrial research and advanced theoretical research across several changes of empires, if you will. There's Austria-Hungary, there's the Nazis, there's the communists, and all through that, there is this preservation, or an effort to preserve the excellence of the scientific institutions, and it must've been difficult.

Kunz: [00:30:24] I think you are right. Nowadays, the ratio of students to inhabitants is in Brno the highest in our country. We have nearly 400 thousands of employees, and we have 80,000 students in Brno. So, it is something.

Burnett: [00:30:45] You have 4,000 employees for the Academy of Sciences?

Kunz: [00:30:52] No, no, no. Brno has altogether 400,000 inhabitants and 80,000 students. 400 to 80. Yeah. It is the highest ratio in our country, much more than in Prague, for example. And up to now Brno, from the point of view of, I would say, science, technology, new technologies, is on the top.

Burnett: [00:31:22] Yeah.

Kunz: [00:31:23] It is the city of electron microscopy, for example. So it is based on the Institute of—

Burnett: [00:31:32] Scientific Instruments.

Kunz: [00:31:34] Instruments Institute. And simply this is a continuation of this development.

Burnett: [00:31:40] And so there's, of course, this effort from the 80s to the present to integrate the needs—I'm talking about the United States, for example—the needs of industry, to respond to them, not to have an Academy that is completely separate, but to use industrial questions to pose fundamental research questions. Was that ever a

completely separate set of concerns or was it, because of Brno's history—was there always a consideration of industrial problems in the work in physics?

Kunz: [00:32:32] Our Institute since the beginning had a special position because we were an institute focused on iron and steel and the quality [thereof], and the Czech Republic was excellent in production of steel and machinery. So our institute really had a really close connection to many institutions and companies. For example, in eastern Slovakia, in *Košice*, continuous casting was introduced in the 80s. It was a really new process, which was developed in Western countries and also in our country. So it's a moment when we were really on the top in the world and our Institute had a special research plan for the development of this casting, and it was based on technology, but also on the properties of this material. So we studied the phase diagrams and so on. So it was really a basic research connection, this application to industry. So from this point of view, we were good. Another example, Czechoslovakia was able to produce pressure vessels for nuclear power stations. How many countries were able to produce such things?

Burnett: [00:33:54] To produce what?

Kunz: [00:33:55] Pressure vessels for nuclear power stations.

Burnett: [00:34:00] —to contain the high pressure.

Kunz: [00:34:02] —in Škoda works. Not many countries in the world, five maybe. And we were studying the behavior of these materials, under high temperatures, creep problems, how the structure changes, what about the propagation of cracks? And these things were theoretically solved in our country. We cooperated at that time very closely with Russia, in Kiev. I was many, many times in Kiev, in The “*Institut Problem Pročnosti*”, today *Instytut Problem Micnosti Im. H.S. Pysarenka*, and it was really good cooperation at that time. So I think that our relation to and our context of industry was very, very close, and on a very high level, so after this Velvet Revolution, at least in my area of fatigue behavior of materials, we were practically on the same level as our colleagues in Germany. We knew about them. We had read the literature, naturally. We had the opportunity to buy literature. And so we were practically on the same level. So after the border was open, it was no problem simply to cooperate on the same level without any big problems, at least in this area.

Burnett: [00:35:26] In this area. And it becomes, I mean, it's so crucial that the transformations of the steel industry in the 1980s and development of German technologies with the [electric-] arc furnaces and all of that, in the casting, spray casting, where you're actually solving the problems of, well, I shouldn't say solving the problems, but dramatically reducing the problems of crack propagation. This science and these technological applications can produce things like turbine blades that don't fail even at high temperatures, but it's always a quest. You've never completed the task of fully understanding materials. There's always a new frontier. Let's return to your personal career. Tell me a little bit about that first important paper with Professor Černohorský, the kind of work that you were doing. Can talk a little bit about, in the 1970s, some of your first publications and the work that you were doing?

Kunz: [00:36:46] I remember that I have discussed many times these things with him. He was a perfect teacher. He would tell me, “This is not written in the right way. You have to reformulate it. Yes? You understand it as an author, but somebody will read it. And you have to explain it to the reader, not for you. For you, it is clear, but it has to be understandable.”

So from this point of view, Professor Černohorský the teacher helped me very much, and he was reading everything really carefully, and I was of the opinion that there were no mistakes in this paper. After some years, I found a mistake after such reading by Professor Černohorský. It’s a joke. [both laugh]

Burnett: [00:37:39] There are many things that you need to be an excellent scholar. You can’t just be a good experimentalist, right? So there are these virtues of a scientist that you must consider, and communication isn’t necessarily at the top. You’re thinking, “I need to understand it myself and for my colleagues.” But you have to demonstrate the effectiveness of your results. So there’s an element of persuasion and communication that is really important.

Kunz: [00:38:18] Exactly. It is really important. And I think that in the past, we had more time for writing papers. For example, I was not under any pressure to finish tomorrow. No. It should be perfect. And when it is perfect, you can publish it. So it is different to nowadays where we publish papers without any more details, just publish, publish, publish!

Kunz: [00:38:51] But it’s changed everywhere. If I read now old papers from my area, and which we have published, I don’t know, in the sixties—in Western journals it is the same—these papers are clear, clearly described problem, what they found, and what is new, papers which are excellent. Nowadays, you read a paper and it is practically nothing new. Publish, publish, publish.

Burnett: [00:39:21] Yes, this emphasis on quantity, that it’s part of the problem of metrics of excellence, but measurement—

Kunz: [00:39:31] But it’s a development in the whole world. It is not only a problem of our country; it is a general problem.

Burnett: [00:39:40] Let’s talk about that I think near the end of our conversation, I’d like to get into that with you about how things have changed dramatically. One of the concerns as a new scholar is that you want this first scholarship to be excellent. So there is a pressure. I think when you’re, when you’re beginning that you want this paper to be really perfect, as perfect as you can make it.

Kunz: [00:40:08] Professor Černohorský was very strange. He, for example, wanted to have a new secretary and she should know—how would this call it?

Burnett: [00:40:25] Shorthand?

Kunz: [00:40:26] Shorthand, yes. Shorthand. It is in English. And he simply put her at a table and he wanted for her to be as quick as he was able to explain his ideas. So he was really, really strong. [laughter]

Burnett: [00:40:50] So he inspired you in many ways in working with him.

Kunz: [00:40:56] Definitely. He inspired me, that, if I am writing down something, it should be perfect, naturally without mistakes, but also understandable for other people.

Burnett: [00:41:07] Right, right.

Kunz: [00:41:08] Which is important. Yeah?

Burnett: [00:41:09] Absolutely. During this time you are working as a specialist for the Institute of Physics of Materials at the Academy [Czechoslovak Academy of Sciences] and you receive your CSc. degree, and that's 1977 ["Candidate of Sciences" under Soviet-style education system, equivalent to PhD].

Kunz: [00:41:36] It was quite funny, also. When I finished it, I was not a member of the Communist Party. And it was a hard period at the time. And our director, Professor Ryš was really excellent. He was at the top in this communist hierarchy. He was an academician, he was quite powerful, but he was very reasonable and he wanted to have an institute that was really good from the scientific point of view. So although people were not in the Communist Party, they had the possibility really to work on scientific problems. And if somebody was good, he was of the opinion, why not be "Candidate of Science?" So in my case, I was not in the Party, and a professor called me when I finished my thesis, and naturally it needs to be approved by the Communist Party. It was not only a problem of scientific quality, but you have to have also this decision of the Communist Party and Professor Ryš developed the so-called sandwich model: one thesis from a member of Communist Party, my thesis [underneath] and the third thesis again of a member of Communist Party, and these three theses were sent to the politburo, which means this communist party organ. And the first time, it wasn't successful. So Professor Ryš told me, "Mr. Kunz, this time we were not successful. Next time, after half a year." And after half a year, he repeated this procedure, again three PhDs, mine in the middle because he was of the opinion that it is good. And I went through this communist, how is it called?

Burnett: [00:43:35] Adjudication or evaluation? System of approval.

Kunz: [00:43:39] Yes. So Professor Ryš was really a very good director of the Institute. He evaluated simply the quality.

Burnett: [00:43:46] So all the positions of, certainly at teaching institutions—at Masaryk University, to be a professor you had to be a member of the Communist Party, mostly.

Kunz: [00:43:59] Mainly. Naturally, there were some examples where it was not necessary, but it was only very few people. In our Institute the situation was very, very good, just due to the reasonable politics of Professor Ryš.

Burnett: [00:44:20] So I should perhaps pause and ask you to reflect on the dual nature of higher education and research in the Czech Republic, because in the United States it's a bit different. So there's the university system in the Czech Republic. Can you talk about

the Academy in the Czech Republic and how it's different, or how it complements the university system?

Kunz: [00:44:53] According to my feeling, the difference was the following. If you were at a university, you should educate the new generation. From a political point of view, you should be good in communist ideology. If you were in the [Czechoslovak] Academy of Sciences, you had no influence on the young generation. You cannot do something too much bad for the system, and so you have peace for study. So at many institutes of Academy of Sciences, we had very good conditions for science, from this point of view, because political pressure, pressure on the institutes of the Academy of Sciences was much lower than at universities.

Burnett: [00:45:43] So the idea of influence. Interestingly, we have professor Černohorský who had this influence on you, on other scholars, on other accomplished figures in administration and in Czech public life. So he *did* have this influence and he was not a member of the Party. Was it dangerous for him?

Kunz: [00:46:21] Definitively, it was not an easy position, but in this time, at some position it was dangerous. For example, for Professor Ryš, it was also dangerous to do something like with the sandwich model. So it was complicated and it depends on the personality. There were people—as in the whole society—good people, worse people. So it depends on the quality of the people. Just philosophical moment. [laughs]

Burnett: [00:46:55] But it is. It's, it's important. It's, how do you survive in that atmosphere? You have to be very careful.

Kunz: [00:47:05] Exactly.

Burnett: [00:47:06] And I think it was important to be—I think the refuge for Professor Černohorský was science: "I'm evaluating someone on their scientific basis," and he refused to join the Communist Party for his reasons. And you did not join the Communist Party.

Kunz: [00:47:28] Yes. I was also not in the Communist Party, but yeah, that was our situation in our Institute. The dissertation was very good. They asked me if I wanted to go to the Communist Party, and I told them, no, I am not interested in it. In many institutes of the Academy or at the university, it means you have to go. But in our institute, the situation was so good that I had good results, so I could stay due to this reasonable politics of Professor Ryš, if I understood your question well.

Burnett: [00:47:59] I'm not sure if I understand my question. [laughs] I wonder if the Academy of Sciences then had a reputation. It was under some suspicion. In other words, did it attract people who did not want to join the Communist Party? Was that a perception in the Party?

Kunz: [00:48:22] Not so openly, but generally in the Academy of Sciences, the situation was better than at universities.

Burnett: [00:48:31] And they were the members of the Czech Academy of Sciences.

Kunz: [00:48:35] Well, it depended on the Institute very much. It depended really on the chief of the institute.

Burnett: [00:48:44] So the leadership—

Kunz: [00:48:45] Leadership was extremely important, from this point of view.

Burnett: [00:48:49] And they could protect—

Kunz: [00:48:50] Yes, exactly. In our institute, nobody went [was fired] after the year '68, nobody. So it is really some exception among many other institutes of the Academy. Many people who were active in the year '68 had to go. And it was a little bit different for Professor Komrska; his position was much more complicated than mine.

Burnett: [00:49:19] Well, this is a difficult—I read one history of this period, and the historian described it as, unlike an invasion with actual terror and murder and arrest, it was almost worse. The consequences of being out was very—it was not just that you leave an institution, you are “out” out [banished from civil society]!

Kunz: [00:49:56] What is quite interesting: people who were not in the Communist Party before, they usually went through these changes without any problems; people who were in the Communist Party and were active in this year of '68, they were punished too much. Yeah. So, it was a difference. People who were like me went relatively peacefully through this period.

Burnett: [00:50:27] Hmm. So it was a real risk to—

Kunz: [00:50:28] Naturally, if you were openly against this system and, say, would demonstrate like a Václav Havel, it is different position, but it is not typical for all people. I would say that the majority of people was of my behavior, yes. More careful, maybe.

Burnett: [00:50:49] You know, there was an underground, a literary political underground that you spoke of, like Václav Havel would be another example. But there was a scientific underground too, wasn't there?

Kunz: [00:51:05] For example, I also copied this “The Two Thousands Words” [by Ludvík Vaculík] and distributed it. [Full title: “*Dva tisíce slov, které patří dělníkům, zemědělcům, úředníkům, umělcům a všem*”]

Burnett: [00:51:11] Can you talk about that? What was this a material that you—

Kunz: [00:51:15] Yes, I just left this material at home. It's a pity that I didn't bring it. I typed it on a typewriter and redistributed it in our society at the time.

Burnett: [00:51:26] And it was a 2000 words—

Kunz: [00:51:28] Yes. “The Two Thousand Words.” It was this well-known manifesto.

Burnett: [00:51:34] Right.

Kunz: [00:51:35] So, it was a completely known that it is distributed and so on. There were people in the institute, who were not informed that we had such things. It was this tension among some members of the Party, but it is normal in the society. Some people who are, I would say, collaborating or not are against. So it is a normal society.

Burnett: [00:52:05] And as you said earlier about your family life, there's the public and the private. So the underground was kind of a private public!

Kunz: [00:52:14] Yes. Yes. So the underground was here, yes? It is really very difficult to describe it because it was on different levels. Yes. It depends on your parents, on your friends, and on your situation. So it is such a complicated, complicated life.

Burnett: [00:52:32] Yeah, absolutely. We were talking about politics and things, but back to the science in the 70s and 1980s your research, you were interested in metals, fatigue, and the propagation of cracks. So, was there a standard understanding of cracks and crack propagation that you wished to investigate and where you were you part of a group that was trying to understand a particular set of problems? Can you talk about that a little?

Kunz: [00:53:14] Yes. At the time, the new fracture mechanics was introduced and it was a question, how to describe the propagation of cracks. We know that nowadays airplanes are flying with cracks, and we have to predict the lifetime. And it started in this period. So, we worked on the examination of processes which are running in the plastic zone. What happens when the crack is propagating through grain boundaries, how to model it, and how to predict finally it's lifetime. And it was our main work. Naturally, the new systems like electron microscopy appeared. So we studied with new techniques these problems and in this way we tried to push our knowledge for itself and actually cooperative with industry because it was interesting for airplanes, for everything.

Burnett: [00:54:24] And did that also mean that there were collaborations between, or among the institutes, because you had the Institute for Scientific Instruments and electron microscopy is a big industry in Brno.

Kunz: [00:54:42] Yes, there was cooperation, for example, with the Institute of Physics in Prague. So we cooperated naturally.

Burnett: [00:54:49] Okay. Using new technologies to understand—

Kunz: [00:54:57] You have to cooperate if you are working in science. Without cooperation, impossible. Of course, that was a problem that we cooperated practically only with half of the world, yes? That was the problem. And so Russia was good in this investigation. Naturally, if one cooperates with the whole world, it is better.

Burnett: [00:55:18] Yeah. But you, you said you went to Kiev repeatedly, and there was a center there, which was *the* center for, for Russia, for the Soviet Union.

Kunz: [00:55:28] It was the *Institute Problem Pročnosti*, it means, "Institute which focuses on problems of strengths of materials." So it was very close to us, and we collaborated at the time on the development of materials for power plants. So we

investigated in our institute the propagation of fatigue cracks in materials which are used in these pressure vessels for nuclear power plants.

Burnett: [00:55:59] Yeah. And during that time there was, of course, a catastrophic failure of a nuclear power plant. That must have been a challenging—

Kunz: [00:56:07] But it was a human failure; it was not material failure.

Burnett: [00:56:14] One of the questions I think of when looking very broadly at a career lasting many decades—science often proceeds incrementally. So there are these tiny changes and shifts and contributions to a particular way of understanding of phenomena. Can you describe some categorical moments or moments when there's a real shift from one level to another, or it's a new way of understanding in materials science in the work on fatigue? I noticed that you moved from some questions to new questions. So in the seventies and eighties, it's the propagation of cracks, and then in the early two thousands, it's cyclical plasticity.

Kunz: [00:57:13] Definitely, fracture mechanics was a step forward. But otherwise I think it was a very slow improvement in knowledge.

Burnett: [00:57:26] Can you talk about that, the introduction of fracture mechanics, the way of understanding before, and what fracture mechanics does to our understanding?

Kunz: [00:57:37] Fracture mechanics allowed us to describe the propagation of fatigue cracks by means of some equations or models. And it means finally that it is possible to say, for example, this railway axis is able to be active for the next five hundred thousand kilometers, for example. So, it was something valuable for industry. Naturally, we obtained new information about a problem, about the physics, what happens in the plastic zone, how the crack propagates in different materials, different types of steel, and so on, in pure copper, how a model works, how cracks begin, for example. Up to now, there are many models of how to describe the initiation of cracks. So, it is, I would say, continuously growing knowledge.

Burnett: [00:58:34] Yes.

Kunz: [00:58:35] At least in this area. In physics, we can find something completely new. Like now, we saw, for example, these gravitational waves. Such things are really steps which are clear. I would say in my area, it is a slow progress or progress. No big steps.

Burnett: [00:59:02] Yes, but you do move from subjects to new subjects. So, in the early two thousands, you work on the cyclic plasticity, so that's high-cycle fatigue.

Kunz: [00:59:16] It is very close [to the subject of crack propagation/ initiation]. So it means if I have a propagating crack there is happening something in this plastic zone is—it means some cycling plasticity of materials. It is everything really close together.

Burnett: [00:59:31] But it's a particular variation of mechanical stress.

Kunz: [00:59:37] Yes. For example, I was interested in copper as a model material. Later on, I went to superalloys, and I wanted to know what happened in this special kind of material, what are the differences in crack initiation, crack propagation, what is the dislocation mechanism initiation in this case and in that case; if the persistent slip bands appear also in superalloys; if the dislocation structure is the same or different. What is the origin and such things?

Burnett: [01:00:07] You said a model material, I just want to make sure I clearly understand it. So in biology for example, you can have a model organism. So the study of the genetics of the fruit fly stands for the understanding other organisms. Is it true for a model material?

Kunz: [01:00:32] I mean by a model material a quite simple material like copper, so quite simple structures, simple materials. If we have these very complicated alloys with twenty different components, it is not for me a model material; it's a very complicated material.

Burnett: [01:00:52] So it does have the same meaning. Because in biology, the *drosophila* fruit fly is, is a kind of perfect organism because of the small number of genes

Kunz: [01:01:06] From this point of view it is similar.

Burnett: [01:01:07] That's really interesting. I want to talk then a little bit about the institutional evolution going into the 1980s and 1990s. Can you talk about the transformation of education along two lines: One is the Velvet Revolution, which of course is very transformative, and the other is the Internet revolution, which happens a few years after, but also has consequences. So let's take the first one, the Velvet Revolution. Can you talk a little bit about how that influences the research that you and your colleagues are doing, what it enables and what changes over that boundary?

Kunz: [01:02:06] First of all, we were a little bit surprised because it came very quickly. If you had asked me two years or one year before the Velvet Revolution that it would be changed, my answer would have been, "Perhaps never." Then, it came so quickly in Europe that we were surprised as were the people in Western Europe. I am sure that the surprise was on both sides.

And, in the Institute, naturally some people left. And the reason was that, for example, we had a computer department. In the same period, a new PC appeared and so on. So there was a dynamic, dramatic change. And this big computer was simply moved. So it means that at least 20 people went from our Institute, because they were not necessary. On the other hand, they had many new possibilities in the country. So it was not a problem for them to go out. Then came a period when the money for our Institute was very, very short, and the salaries decreased, or better to say they stayed on the same level? New companies, new enterprises appeared immediately because we had the possibility to develop new companies, to travel abroad. So, our Institute was in the situation that we had not enough money to pay young people.

Burnett: [01:04:00] —to compete with these other—

Kunz: [01:04:03] To compete, simply, yes.

Burnett: [01:04:04] Because there's a market now.

Kunz: [01:04:06] It was a market now. So, the older people like me naturally stayed here because it was interesting for us, this work. We were simply here. And it was difficult to get new young people and it was a period which was difficult for us. And there is now an age distribution in our Institute, there is this deep [indicating a graphic representation of the age distribution of the demographics of the Institute]—

Burnett: [01:04:37] —trough.

Kunz: [01:04:37] Yes, this valley. And it is naturally shifting towards higher age, and now it is simply nearly in the age of retirement. But at the moment, we have no problems to get good young people, but it was typical for this period after the Velvet Revolution. And it was done by those new, many possibilities of employment in the country.

Burnett: [01:05:08] And so there was an immediate attraction of foreign investment. Was there money coming into the country?

Kunz: [01:05:16] It's difficult to say. Maybe new companies coming in the country, maybe small enterprises which appeared. Many people went abroad also, many students, physicians, for example.

Burnett: [01:05:31] It took some time to stabilize. So this period of the Velvet Revolution was say, 1990 to the two thousands?

Kunz: [01:05:43] Yes. For nearly 10 years, it was very complicated and everything was turbulent and changed quickly. Simply, it was the reality.

Burnett: [01:05:55] And the Internet revolution also happens. Can you talk about how that changes and perhaps it's later?

Kunz: [01:06:04] I am an old man, I have to say. [laughter] I am not on Facebook. You know, with Petr Lukáš, our director, we discussed at the end of the eighties, if it is reasonable for us to start even with [personal] computers, if it is for nothing or if it is something. Later on, naturally, we came to the idea that without computers you cannot live. Definitely this is good. On the other hand, there is this broad, rapidly increasing bureaucracy because due to many Excel tables and so on, you have to do so many tasks, which are for nothing. And it is a disadvantage of this development. For example, 100 emails during one day. It's too much!

Kunz: [01:07:07] I remember Professor Klesnil, my chief, when he sent a letter, he came to the secretary. He walked around the room and simply dictated the content of the letter and the secretary wrote it down. He formulated precisely what he wanted, and the letter was sent to the addressee. Nowadays, you generate twenty emails with relatively minor content and you bother the whole society. So that's terrible. But it is my observation as an old man. Yeah. I think it is too simple, but how to change it, I don't know. On one side, we have nuclear power plants; on the other side, we have atom bombs. So all the things have negatives and positives. And it is the same with computers and this revolution,

right? So it has advantages, but also disadvantages. Advantages are clear, but how to solve these disadvantages, I don't know.

Kunz: [01:08:33] But it is not a special question for me, this question for the whole world, of how to proceed.

Burnett: [01:08:40] Well, I guess, the question can be focused on education, and if it has some kind of a negative or positive impact. For example, in my own world of teaching, plagiarism became a big problem. So people would copy information from the Internet, and they would expect me to—

Kunz: [01:09:07] To trust all news on the Internet.

Burnett: [01:09:08] Yes, right. But we don't educate our students about the dangers of not thinking about—

Kunz: [01:09:21] Yes. It's really problem of society I think.

Burnett: [01:09:24] So this is a challenge that's emerging. It's perhaps less of a concern in science, that students are not—

Kunz: [01:09:34] It's the whole society.

Burnett: [01:09:35] Yes. It's a larger societal question. One other big change, I think, is also the European Union. So that's 2003. Does that impact the practice of science in the Czech Republic and how does it impact from your vantage point, from your perspective?

Kunz: [01:10:02] I think we belong to Europe. No discussion. It's simply our area. The Czech Republic is in the middle of Europe, and we simply have to be nearly one state. But the problem is when the state is too large, the bureaucracy is increasing. So I think that this idea is, without any discussion, absolutely positive. But, we should remove this political bureaucracy and simply take only these five, six important things and to stick to it. Yeah. It is important.

Burnett: [01:10:46] What are the five or six important things?

Kunz: [01:10:48] For example, I think we should have the possibility to move in the whole region, to be in Austria to be in Czech Republic; a free market is necessary; the same *Aussenpolitik*—

Burnett: [01:11:12] Oh, foreign policy.

Kunz: [01:11:15] Exactly, foreign policy, and to have clear borders around this area.

Burnett: [01:11:23] Right.

Kunz: [01:11:24] That's all, not to require that I use this name for our products and so on, such small things. If I should have something like this or like that. No. So, I only want to say is that really we belong to Europe, and it is the only way to proceed now.

Burnett: [01:11:53] Does it impact or does it affect the governance of the institutions that you work at? Are there standards for institutions of research across Europe, for example?

Kunz: [01:12:09] So these European projects are definitely good and the support of science. So European projects I find very reasonable and good. The problem is the bureaucracy, which is connected, and it is also the same in our country. This year, we prepared 32 proposals of projects for our grand agency. The probability that you will get [funding] is nearly 20 per cent. It means it's an extreme amount of work for nothing. So it should be organized better. During the socialist era we had the so-called state plan, and no grants. The pendulum was this side. Now we have practically no state plan, nothing. We have only grants. So the pendulum is here [indicating the other side]. And you know all physicists that we have some single Gaussian curve and that we should have been here [indicating the middle], not here or not here. Right? So from this point of view, I think this support of science in the European Union and also in our country only through grants and small fraction is this institutional support is simply bad. I think institutes like ours should have nearly 75 per cent of income from the state or from some long-term plan, and only 25 per cent really for excellent grants.

Burnett: [01:13:45] It's a problem of, you know, we are balancing values, I think, in these approaches. And so as a counterbalance to—I think the problem of bureaucracy, of a state bureaucracy, for example, was this absence of accountability, that they would fund it, but no one is watching. And so this process of application for grants, this competition is supposed to generate some accountability for the research, that someone is watching and evaluating—

Kunz: [01:14:26] You know, it's only a small part of this whole behavior. These grants are for development of highways and everything. We are only small part, but, we feel it is not a good way, simply.

Burnett: [01:14:39] —and you're surviving on these grants. There was a book about this. It's like an anthropology of a laboratory. It's called *Laboratory Life* [Bruno Latour].

Kunz: [01:14:51] It is in a more a philosophical way how—?

Burnett: [01:14:55] No, it's anthropology. It's literally someone investigating, watching what scientists do in a laboratory as if they were a tribe, and one of the conclusions was that there's so much work in writing the work and sending the writing out. So if you describe what a scientist does, the scientist is constantly writing: "This is what we will do. This is what we want to do." And they send this information out there, writing reports: "This is what we did." You're speaking of this bureaucracy and it's a tremendous burden on scientific leadership.

Kunz: [01:15:49] Definitely. I think the National Science Foundation [in the United States] has also such problems.

Burnett: [01:15:54] Oh, absolutely. Absolutely. So, the Institute of Physics of Materials survives the transition and through the Velvet Revolution.

Kunz: [01:16:09] I think without any decrease of output. So the number of people in our Institute decreased, the output is practically increasing or constant. So from this point of

view, I think it was surprisingly not negative, if I take number of papers and so on, but it is really a difficult to evaluate it because now we publish a little bit more and more quickly than before. But there are some results of our Institute which are now in textbooks, and I think it is important.

Burnett: [01:16:51] Can you talk about one or to—

Kunz: [01:16:53] For example, in the case of this crack initiation. In the 80s, we observed the formation of persistent slip bands in model material couple, how dislocation structures are organized and how then cracks develop.

Burnett: [01:17:15] What are the bands—?

Kunz: [01:17:16] Persistent slip band. PSB, persistent slip band, and it was observed in our Institute. My friend Petr Lukáš, myself and our other colleagues, we simply published this observation, and you can find it today in practically all textbooks on fatigue. And it is important for me. Another example can be found in phase diagrams. So I think such indicators are very, very good. And you can find it after some time. So I see now our results, which are quite old. Maybe now we have also some interesting results which will be shown after 10 years, but we have to take some time for evaluation of such results. So at least this one result is good and our Institute has the right to feel—

Burnett: [01:18:24] — to feel good about these, to feel pride about these accomplishments.

Kunz: [01:18:32] So we are proud this.

Burnett: [01:18:33] Of course, of course. Now just prior or during the Velvet Revolution, you passed from being the *Candidatus* to being the *Rerum naturalium doctor*.

Kunz: [01:18:49] It was quite funny because I was not in the Communist Party. I finished my high school, so I got the title *promovaný fyzik*, which means “graduate in physics,” so it was a special title, practically, it was like “engineer.” And because I was not in the Party, generally my career was clear: I can be an researcher in our Institute. Naturally, I was not able to be a chief of department or director. So my career was practically stopped at this level. Otherwise, I had to be a member of the Party to go further. And because I didn’t want to go this way, I peacefully worked on my problems and everything was okay. And also, if I wanted to get this title, which was PhD, I [would have] had to go to the Communist Party and ask and so on, to cooperate with them. And because I was not interested, I went through life and in the year ‘90, naturally, I asked the university if it was possible to get this title. Why not? And so I went through this process. It wasn’t an examination. I only showed that I was good in this area and that’s all, and I got this title based on my work before.

Kunz: [01:20:25] That’s why I got this title so late. It was quite funny because, before I was “Candidate of Science,” which is a little bit higher, and then I got this title before.

Burnett: [01:20:41] That’s interesting. So because of the Velvet Revolution, is it that there was a kind of compression of these scholars who did not wish to join the Party for whatever reason, and all of the sudden, they are liberated in a way? They are now eligible

for all of these positions across the Czech Republic to do with higher education. Is there a large group of people who are at the Academy of Sciences who, who then moved into positions?

Kunz: [01:21:27] Perhaps not. I think in our Institute maybe five, six persons.

Burnett: [01:21:35] But across the Czech Republic, that adds up to a large number of people.

Kunz: [01:21:39] Perhaps, yes. But I cannot say—

Burnett: [01:21:44] Well, I can actually reverse it. So, after the Velvet Revolution, were there consequences for the people who were in the Communist Party? Was that a negative thing to have been a member of the Communist Party, or is it just to start anew, everything is—

Kunz: [01:22:11] You know, there were many discussions about this problem and it depends, again, on people, and so on. Some people were very surprised, some were going in the Communist Party, and after the Velvet Revolution, they went again even higher, even higher. So it depends on the quality of people.

Burnett: [01:22:37] Yeah.

Kunz: [01:22:39] It's just, many people who collaborated with Nazis, many of them were very active in the Communist Party after the year '45. Right?

Burnett: [01:22:49] Right. So they're ambitious people.

Kunz: [01:22:52] Ambitious people. This is all societies, right? So nothing new below the sun.

Burnett: [01:23:00] So, where I am going with this is that in 1994, you are the head of the Mechanical Properties Department, but it didn't matter that you were now free to become the chief—in other words, could you have become the chief of the mechanical properties department—

Kunz: [01:23:26] Before? No. Definitely not.

Burnett: [01:23:32] So this was a happy change, or—

Kunz: [01:23:35] That's a question if it was something good for me or not, because bureaucracy and so on and so on. So simply, at the time, the director of the Institute came to me and told me, "You are old enough, so what about taking this department? You have experience," and so on. "You know the Institute; you are here many, many years." I told him "No, I'm afraid," and so on. And he decided for me to be the chief of the department. So, it was easy, and I was chief of the department for 20 years, and then the situation was the same, simply, I was asked to continue as a director. I was not very happy with this function.

Burnett: [01:24:19] Well. It's a, it's a real burden to be the head. It's a lot of work and it's not science.

Kunz: [01:24:28] It's not science. Exactly. It's not science. And sometimes, if the bureaucracy's increasing, you have not good feeling. And though you are older, you feel these problems more, I would say. So there's a problem. If you are young, you are going through these things much more easily than if you are older. Yes? You are worried about various things, about the Institute and so on. So it's not easy, but I think it is typical for all people when they are growing—

Burnett: [01:25:03] Well, you see trajectories.

Kunz: [01:25:06] Yes.

Burnett: [01:25:07] You see trends and so the trends are problematic for you.

Kunz: [01:25:13] Exactly. And it is problematic. Yes? Naturally, older people are more pessimistic. It is typical. You have to fight this development, but if you have really long experience, you can extrapolate.

Burnett: [01:25:29] Well, maybe it's not good for you personally, but it's good for the Czech Republic to have you there because you have this experience and you were not ambitious in that way

Kunz: [01:25:45] Yes, but I am only a small story in the whole society.

Burnett: [01:25:49] Of course, of course, but maybe another way of saying it is: ambition is good, but ambition to rise in administration because of power, because of influence, is that better or is it better to have an accomplished scientist who reluctantly agrees—

Kunz: [01:26:15] I have studied physics from Černohorský, I would say we should be here on the Gaussian Curve [indicating the middle], not here, not here [indicating extremes], though we are pushing or moving left and right, so we have to find the right way. The right path. And it is life, simply.

Burnett: [01:26:33] And so when you think of science leadership, you think of what is good for students, what is good for scientific productivity?

Kunz: [01:26:43] Exactly. I have now really a problem to formulate the main orientation of our Institute for the next years. It is not a simple task because materials were important, since people have been in the world, they are important now, and I think materials will be important in the future because raw materials are exhaust—

Burnett: [01:27:16] —or they are declining availability.

Kunz: [01:27:19] Declining, and we will be pushed to develop new materials. So I think from this point of view, our Institute has a really good future, definitely. But we have to find a really good areas of where we should go. And this is not so easy a task.

Burnett: [01:27:41] No. No.

Kunz: [01:27:42] Recycling, for example. Maybe it will be very important for the next generations.

Burnett: [01:27:49] And new materials, as you said, ones that promote efficiency, so, energy consumption—

Kunz: [01:27:57] Yes, some special structural materials, energy production. We are working on materials for fusion reactions. This new ODS [types of steel], for example. It's quite funny. When I started to study physics, we heard that this fusion reaction would be possible within 20 years. And what we hear nowadays is that it will be possible within 20 years. Of course, now we are able to start up this reactor, but to the real production, again, 20 years. So, during my whole life, yes, it will be shifting. There are big problems, material problems, how to produce these vessels for this plasma and so on. But, it is quite funny that from a theoretical point of view, it was clear that by the end of 20 years we would be able, and now from the material point of view, perhaps we are still waiting.

Burnett: [01:29:05] Well, that is the story of engineering, right? A lot of the theoretical—fission, for example. Once it was discovered, [the attitude was] “Oh, yes, you could make a weapon out of this.” But actually making a weapon or actually making a reactor that was safe and efficient, that's an engineering problem. And it took an army of physicists and engineers to really develop it.

So you're helping to shape the direction of materials science research in the Czech Republic and as part of that, so you're the head of the Mechanical Properties Department at the Institute of Materials Physics from 1994 to 2012, and then it's basically converted to the Director of the Institute from 2012 to the present. And you're also in science governance for the larger Academy. You're a member of the Academy Assembly [Czech Academy of Sciences].

Kunz: [01:30:08] Yes, I am a member of the Academy Assembly. I cooperate with these other directors of the Academy. We have meetings. We discuss the future plans for the academy and so on. If you a director, then, naturally, you cooperate with other directors.

Burnett: [01:30:24] So, although it's not direct scientific research, it is exciting, in a way, because you're participating and learning [about] and shaping the future direction of the research of other people.

Kunz: [01:30:39] Yes, that's true. [laughter] But I solve usually small partial problems and I take it not in this, I would say, general way, because we have some problems, for example, how to in this moment develop the strategy of the Academy as a whole. On Friday, we had a meeting in Prague, some small conference, and directors of the Institute presented there on how we cooperate among institutes in the Academy, how we use these big research infrastructures, which were paid for and developed by the European Union, how we cooperate with industry, and so on. So, we have discussed the whole strategy of the Academy, how to present the Academy to society, how to present our results, how to help industry, and how to help the education of a new generation. So such a meeting was quite interesting last Friday in Prague.

Burnett: [01:31:43] And I imagine that the balance is investigating best practices in other countries, other institutional models with the existing institutions in the Czech Republic, and you're constantly assessing, should we—I'll pose that as a question: Do you, and your colleagues at that level, do you think about and observe institutional structures in Germany, in—

Kunz: [01:32:23] Naturally. We are, for example, discussing how the *Fraunhofer Gesellschaft* [Fraunhofer Institute] works. It is a little bit similar to our organization. And, we definitely learned from other countries too. So it is a process.

Burnett: [01:32:43] And during this period, a little bit earlier, there is this work at Žilina in Slovakia. Can you talk about that?

Kunz: [01:32:57] Yes. It's quite simple. During the Communist Era, there was a state plan. The state plan was not so bad, and our Institute organized research in this material science. And Žilina University was a member of this community, let us say. There was a group which was dealing with ultrasonic fatigue, fatigue with very high frequencies, and they were good during this era before '68, Professor Pushkar, the late Professor Pushkar, was in Britain. And, he got experience with this ultrasonic fatigue and he started to perform experiments and I cooperated with them in an informal way. And then, based on this cooperation, I had some students. I had some lectures there. But, after some time, he came to me and told me, "You are teaching here so long. Why not become an associate professor?" And I told them, "Why? I have my work. It is not necessary for me." And they told me, "Nonsense, you should be associate professor." They pushed me into this title. So I got it, and because I was continuously working there, I became a professor. The separation of states, Czech and Slovak Republics, didn't play any role, because it is practically now one state, I continue in Žilina, and I'm on the scientific board ever for the last 20 years.

Burnett: [01:34:48] Okay. And there was teaching involved, and that teaching continued after you were the head of the Mechanical Properties Department. And so, did it give you an outlet?

Kunz: [01:35:06] Definitely. It is interesting to have students, discuss with them. And later on I had only PhD students, not this basic school, but only PhD students and, frankly speaking, two of them are now in our Institute. I invited them and they stay here in Brno.

Burnett: [01:35:29] There is a real importance, I think, of institutional circulation.

Kunz: [01:35:34] It is good cooperation and with Žilina University my relationships are excellent.

Burnett: [01:35:40] We were talking off camera about the challenges of young people today studying science, studying mathematics. And I would ask for your reflections on that. As, as more knowledge is produced, there is more to know, and the temptation in science education is to pass very quickly through fundamental steps to the frontier of research and the students want that. They want to get right to the most advanced [science] quickly. I want to ask for your reflections on your education, your inspiration from Professor Černohorský and other mentors, and your lifelong experience teaching and mentoring other students. Can you talk about education today, if you have advice for

young people who are studying physics and want to become physicists, if there are things that they need to be careful of, ways of learning that they should be aware of?

Kunz: [01:37:08] I think the a number of excellent students is nearly the same, from 30 years ago to nowadays. The problem is that now we have many, many students, and the number of really good students makes, for example, 5 % only. We were, I don't know, 20 and again, from 20, this 10 %, let us say. So the number of excellent students, who are really deeply interested, in the problem is, according to my opinion, the same. The number of students is simply too high. I think that that is a bad decision in the European Union, that all people have to have a high school education. It's nonsense. I have my own house. And I like to do something with my hands. And some years ago I repaired this house, and there was a company who produced this, how it is called?

Burnett: [01:38:08] Sheet rock? Gypsum board?

Kunz: [01:38:12] Because, many years ago, I built my own house, I can do it. I like this. But I observed this manual worker people and I told myself, sometimes, I value more such men who are able to do it with this perfect knowledge and practice than a bad professor. So, although I am highly educated in this area of science, I admire people who are able to do something really with their hands. And, this is a problem I have discussed with chief of the company TESCO. It is difficult to find people who are able to produce something special with their hands, which is no serial [mass] production. If you develop a new electron microscope, you have to do things also by your own hands.

Burnett: [01:39:12] Absolutely.

Kunz: [01:39:14] And such people, today, you simply cannot find, so this experience in this manual labor is decreasing. That's a problem. You can work on a computer, you can find everything on Google, but you are not able simply to take a screwdriver and to do something.

Burnett: [01:39:45] To fix your toilet.

Kunz: [01:39:47] Yes. That's a problem of the society. And I think that is not good to not value such good work.

Burnett: [01:39:57] Yes, we are devaluing manual labor. It's true. And it's funny you should say this because in the United States, in politics, the model is the European Union. They're saying, "Why don't we value—and Germany, in particular in Germany, you can learn a trade and have a high salary compared to someone with a professional degree or higher education degree." But we insist that everyone should go to university and pursue to the highest level.

Kunz: [01:40:39] It's not a good way.

Burnett: [01:40:41] No, no. And industry has said we need people who can do this highly specialized work that is very important and we are not preparing people to, to develop this. And I don't know what the answer is except that we value, in our culture, we place this extremely high value on pursuing higher education and the medical profession and law. And we have this excess of lawyers.

Kunz: [01:41:22] It is the feeling of society, and it is not good. It has to be changed. For example, in agriculture. If you have people who see the field and say, “Ah, we should do it in this way and that way,” you have to have experience.

Burnett: [01:41:44] Yes, our modern condition rests on advanced knowledge of agriculture. That’s something we forget over and over again.

Kunz: [01:41:55] Again, the Gaussian Curve! We have to be here [pointing to a middle space on an imaginary line, not only in universities [on one end of the line], and not only people without university [on the other].

Burnett: [01:42:02] Some kind of balance.

Kunz: [01:42:03] The physics is valid, right? That’s important.

Burnett: [01:42:10] No, of course. The normal distribution.

Kunz: [01:42:13] The normal distribution.

Burnett: [01:42:15] Absolutely.

Kunz: [01:42:17] You cannot go against it in society.

Burnett: [01:42:20] Professor Kunz, I want to thank you for taking the time to speak with me.

Kunz: [01:42:24] I apologize for my English because some things were really difficult to express in English.

Burnett: [01:42:32] I thought you expressed them very well. Are there other thoughts you would like to share? This is a brief discussion. I want to give you an opportunity if there’s something we have not discussed that you would like to mention about yourself, about physics in the Czech Republic, or about Professor Černohorský.

Kunz: [01:42:57] I don’t know. We exhausted many, many themes and even sometimes philosophical problems, which are perhaps important for the world. Yes? But I’m not feeling responsible for the whole world.

Burnett: [01:43:13] Well, we will not resolve them in the time left. Yeah, definitely.

Kunz: [01:43:17] Nevertheless, I think if I summarize it, for me it was really interesting to work in this field. I think that our results from our Institute are quite good, on the international level. Definitely. And I hope that the Institute will have a good future. And I hope we meet after some time again and we can see if I was in the right way or not

Burnett: [01:43:57] [laughter] Perfect, until then!

Kunz: [01:43:57] Thank you.

Marie Fojtíková

May 20 and 21, 2019



Marie Fojtíková and Paul Burnett, Brno, 2019

Biography

Dr. Marie Fojtíková is the Secretary General of the Czech Rectors Conference, the association of all the leaders in higher education in the Czech Republic. She was a graduate student in physics at Masaryk University, during which time she worked as a student assistant with Martin Černohorský. She was also his doctoral student (RNDr.). After refusing to join the Communist Party of Czechoslovakia, she was not allowed to complete her graduate studies at Masaryk University, and became a scientific researcher in the Institute of Scientific Instruments of Czechoslovak Academy of Sciences, working with Jiří Komrská. Her collaboration with Martin Černohorský continued within the Union of Czechoslovak Mathematicians and Physicists, where she was active in organizing several seminars and conferences dealing with university education in physics. Thanks to Professor Černohorský, she also participated in and worked for the “Underground University” during the communist period. Before the establishment of the Czech Rectors Conference in 1993, she interrupted her research to assist in its creation. Since then, Dr. Fojtíková has managed the institution and the relationships with counterpart organizations among the EU member states.

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Burnett: [00:00:00] This is Paul Burnett, interviewing Dr. Marie Fojtíková of the Czech Rector's Conference, and this is our first session as part of the Martin Černohorský/ Czech Physics Project. This is May 20th, 2019, and this is our first session. Welcome Dr. Fojtíková .

Fojtíková: [00:00:56] I am happy to be with you.

Burnett: [00:01:00] Wonderful. So we usually begin a life story with the beginning of life. So can you tell me a little bit about where you were born, your parents, and life before university?

Fojtíková: [00:01:18] So I will try to think of it. I was born in 1954 on the 29th of June. It is the day of Saint Peter and Paul, so I am very happy because of that, and I was the third child of my parents. My mother was named Marie, same as me. It's interesting that the first child, brother Karel, was named as his father. My father was Karel. It's "Charles" in English. Alena, my older sister, was not named as her mother, and it was me, the second daughter. I have also younger sister. Her name is Miluše, something like "Mila" in English. So we had a relatively big family, not too rich. So I remember that my parents were all the time working, doing something so we could survive. They both had just a primary education or basic education, and it would require more time to explain it in more detail.

Maybe an interesting thing is that the father of my mother, my grandfather, was half-Austrian. One of his parents was Austrian and the other was Czech, and my grandfather never spoke perfect Czech. It was funny to us as children. And we lived in a very small village, very close to the border with Austria. And I remember how my mother retold all of these stories when it was possible. She was born in 1931. She passed away sixteen years ago. She was only 71 when she died, and she was talking about how nice life was when they were allowed to go to the forest in Austria and back. So when I was born, there were these—

Burnett: [00:04:47] Like a fence?

Fojtíková: [00:04:49] A fence, made from metal, sharp—

Burnett: [00:04:56] Barbed wire.

Fojtíková: [00:04:57] Yes, yes. And every fifty meters, soldiers with [miming holding a rifle]. Yes? So when we were walking or on a bicycle, it was very stressful because you could notice that you were followed all the time. So I was extremely happy after 1989 that these fences disappeared.

Burnett: [00:05:36] So you grew up on the border between East and West.

Fojtíková: [00:05:42] Yes.

Burnett: [00:05:43] You saw it. It was that close to you.

Fojtíková: [00:05:47] Yes. I remember that we were visited, not very frequently, but from time to time by a cousin of my mother who lived in Austria in Retz, if you know it,

it's a very similar place to the Czech city Znojmo, where I was born and visited when I was in secondary school. So he visited us, and we were discussing the situation, and the whole village was a surprise because it was not allowed for us to go to Austria and when anybody visited us, it was some important event for the whole village.

Burnett: [00:06:59] Was it positive or negative to have a relative in the West? Were you under suspicion?

Fojtíková: [00:07:06] Negative, negative, absolutely. Negative, yes. So it was clear that it was noticed. Yes? And another cousin emigrated to Australia. And he once visited this small village, the first village was named Šafov. In German, it would be Schaffa and it also had a big Jewish community. Tony Placzek was there and there is a big Jewish cemetery. Later, when I was nine, we moved to a bigger village called Vranov nad Dyjí, or Frain an der Thaya in German. All places and villages had two names: German and Czech. So he visited us from Australia when we were in this Vranov nad Dyjí, and I remember that my mother went to my school and told me, "Marie, go home. It's some event you can see maybe only once in your life," because of course it was, it was difficult.

Burnett: [00:09:01] And so you are growing up in an environment where there is an outside, beyond the fences of Czechoslovakia. And you have some connections and some conversations about this outside world and you're going to school and you are 14 years old in 1968, and so I would like to ask you about that period of reform. Can you describe—you were 14, so you're not quite fully aware of everything, but can you describe that period?

Fojtíková: [00:09:53] I can tell you what I remember. It was 21 of August, 1968 when the Soviet army occupied the former Czechoslovakia and my mother was working at the time in a bakery making rolls and bread, and she worked also nights. So there were three possibilities, maybe only two: during the day or during the night. And the schedule somehow changed frequently. And I remember the day that she came home from her work early in the morning, and they were listening to radio working in the night, not to sleep and so on. And she went to our bedroom and went to each of us and told us, "Wake up. There will be war." And, I remember it to this moment that it was very—we were surprised. Of course. Yes, it was, half past four or something like that in the morning. And it started, but unfortunately I cannot tell you anything directly from the events in Vranov nad Dyjí where there is, by the way, a very nice castle. I was ill during these very first days of occupation.

I don't know whether it's well known, but, in the Czech Republic, surely. Many people gathered in the middle of the village and painted on roads, "Go home." Yes? So, it was after many years, when I thought about it, I could see that people were very active. Not everybody, of course, because mostly people were forced to be Communist Party members, so these people—but, I think it was such a painful event or accident that even communists were protesting. I remember it was summer time, and probably after that I started to attend secondary school, *gymnasium*, in Znojmo, and I remember that one of our professors, a woman, was pushed out. She, she couldn't teach and we were not informed perfectly, but we could feel that something terrible had started. Yes? So, teachers who were protesting and who were not compatible with a communist philosophy were not allowed to teach. And she was not the only person. But when we met after many

years, we always invited her, and, I am repeating and repeating again that I feel a little bit ashamed that we all knew that she had such troubles, because she finished as an ordinary worker, some terrible work. What was very nice was that her answer was, “Marie, you were too young to understand everything and to understand the depth of the situation” and that she is not angry that we as 15-year-old children didn’t do anything else or didn’t do anything with effect.

Burnett: [00:15:40] Yes. But it struck you subsequently. You realized the consequences of political involvement and that people were punished arbitrarily for resisting the authority or the reestablishment of communist authority. I read in history books about this period of normalization. What was terrible is that instead of a fight, it was not a fight with weapons very much. It was this removal of people from society. They were a teacher; now they cannot get a job anywhere. They cannot have any influence, any public life. So the Communist Party control was very complete and it changed people’s lives tremendously.

Fojtíková: [00:16:58] Surely.

Burnett: [00:16:58] And so you are growing up in that environment.

Fojtíková: [00:17:03] In such an atmosphere. Yes. And of course, our school years were connected by necessity to be members of these unions of youth with this orientation. Yes? It was education or teaching of future communists. So with this red [miming a scarf for a uniform].

Burnett: [00:17:47] Right, right. The communist youth groups.

Fojtíková: [00:17:50] And I, fortunately, I think that I was able, even during the secondary school years, to think of it and I am grateful to God that my inner—my conscience, didn’t like it. I didn’t wish to be active in these societies, so I always tried to survive, to find some substitutional activity. Yes? Because it was necessary. Everybody had to be active, but in the proper way. And so I will tell you later a positive influence of professor—

Burnett: [00:18:49] Well, you talked about substitution, and so, can you tell me about science? Can you tell me about the beginning of your interest in science?

Fojtíková: [00:19:07] Yes. I remember when I was very young, after primary school, I was thinking about being a teacher of this Kindergarten. But I was ill at that time, so I was not able to go to some entrance exams. So it was deleted, and for me it was quite clear what to do, because all the humanities were so influenced by this poor atmosphere and tendency to direct it in one direction only. So I was thinking about studying medicine or some natural sciences. I had no problems almost with anything, being at secondary school, but probably preferred mathematics and these natural sciences. And it was also a question of opportunities, yes? Not everybody was allowed to study what he or she wished.

So maybe it was some kind of prevention, that we had to think of possibilities, and so decided maybe sooner than would be necessary. So it happens that I went to Brno, to

Masaryk University. And it was necessary to go through an entrance exam, and I succeeded.

Burnett: [00:21:49] So it was, in part that you did like science and mathematics. You were good at mathematics and science, but it was partly survival. It was to take, as you say, a kind of precaution, to be careful of your career and your family too, to have some kind of success without depending on the ideology or the Communist Party, and the humanities and social studies, that was all communist-inflected propaganda basically. And so you chose science and you studied physics immediately or did it take some time?

Fojtíková: [00:22:56] Strictly speaking, my studies were composed of mathematics and physics, and it was studies for future teachers at secondary schools. Of course it was possible to do science, but these studies were divided into two parts: There are so-called professional physicists, and then mathematicians and physicists, or biologists and physicists, a combination of these two subjects.

Burnett: [00:24:02] But divided between a science for research and science for teaching.

Fojtíková: [00:24:09] Yes.

Burnett: [00:24:10] And was there a gender aspect to the science for teaching? Was that more for women, because teaching children is associated with femininity? Is that partly in play?

Fojtíková: [00:24:31] What was interesting about my studies was that we had common lectures in the first year of studies. And so we had these professional physicists, future scientists and teachers in one group. And it was very interesting because we could also compare who is who and whether in principle we would be able to do science if necessary. I didn't see myself becoming any [kind of] scientist. But maybe if you could talk with my teachers, I think I was relatively good student. I had no troubles. So in principle, I was able to do again either science or teaching, but I preferred to teach after finishing my studies.

Burnett: [00:26:00] All the way. When you finished your doctorate, yes?

Fojtíková: [00:26:09] Yes.

Burnett: [00:26:08] So you were still, you were focused, teaching was what you wanted to do.

Fojtíková: [00:26:12] Yes.

Burnett: [00:26:15] And teaching at the university because you had a doctorate.

Fojtíková: [00:26:18] Yes. And it is also an interesting point that, as I said, I think I will say I was a relatively good student, no problems. I had only one problem in the course called "Marxism-Leninism." I remember that this professor asked me some nonsense questions and one couldn't be prepared for all such stupidities. So I tried to answer somehow and could see that it was not excellent in his opinion. And he looked at my—I don't know. How is it in English, index? We had such a booklet.

Burnett: [00:27:15] Like a grade book? Does it have the disciplines and, and how well you did in each discipline?

Fojtíková: [00:27:31] With results of exams.

Burnett: [00:27:29] Okay. So your transcript.

Fojtíková: [00:27:35] It looked terrible, and we were evaluated with the best one. Of course, it was also in words described — *Výborný*: number one. *Chvalitebný*: number two. *Dobrý*, good: number three and number four: dead! [laughter] And so he wanted to give me number three and I didn't protest. I was a little bit sad that, because of that stupid discipline, my results would be damaged, but I thought to myself to go there again, better to leave it with three. But he decided to look at my index [transcript] and he could notice that there were better, maybe at the time only ones [top grades]. He told me—he didn't say Mrs. or Miss or my Christian name. We were called *soudruh* [man] and *soudružka* [woman]. And *soudružka* is “comrade.” And for a woman: “*Sodružka*, you have to come again. I cannot damage your results”—so I had a heavy time after that because for one week I tried to learn all this Leninism.

Burnett: [00:30:04] —theory, Marxist-Leninist ideology and principles and so on.

Fojtíková: [00:30:11] It needed some maybe more skillful mind to improvise and to fit with the style of thinking of this person. It was not my case. I felt like using more rationality, and it caused me real troubles. So it was the only problem. And when I finished my doctorate, this *Rerum naturalium doctor*, after one year of study, I informed my surrounding [colleagues] that I would like to stay at the university and to receive this equivalent to the PhD, and so on. And because everybody told me, “you are a good student, you would be a good teacher,” and because I was during my studies something like a small assistant to Professor Černohorský, we were allowed as students to be involved in some exercises here. So I could teach somehow my only one-year-younger colleagues.

[00:32:00] So up to today, if I meet somebody, very, very often I can hear, “Oh, my old teacher!” because we were good friends, but it was better for them to hear explanations from people of the same age, or of almost the same age. And at this point I could see that all of these professors who told me, “you are very good, and you could stay at the university and it would be very nice you could be there, but a necessary condition is to be a member of party, of the Communist Party.” And it was difficult for me. And at that time, our group teacher was Professor Černohorský, and I asked him what to do and that I know that I don't wish to become a party member. And he told me, “Marie. Think of it, who could you allow to go with you to the mountains?” And, for me, the interpretation of it was that I must decide by myself and must have proper priorities.

[00:34:12] And I am sure that he was satisfied with my decision. And from this point on it was necessary to find another job. And I tried for some time to go to some secondary school, but, I remember that at that time nothing was available, but I would like to be in and because I couldn't stay at university.

[00:35:00] So again, thanks to Professor Černohorský, I started my short period in the Institute of the Czechoslovak Academy of Sciences. It's an Institute of the physics of materials. Professor [Ludvík] Kunz is director of the Institute now. He remembers me from this time, and I spent there only half the year. And after that, I don't remember exactly, but later on I cooperated with Professor [Jiří] Komrska at the same Institute he was at that time. And maybe it was such situations that in the first Institute, there was a place only for a limited time. And after that because at that time I was active in the Union of Czechoslovak Mathematicians and Physicists, and they knew me, all these people who like to do something more general because these were these seminars and conferences organized mostly by Professor Černohorský. And he advised us if you don't wish to be Party members, it would be nice. You could be active in your professional associations. So I also am grateful to him that there were very many nice people who devoted their lives to science, to physics, mathematics, and who were also somehow useful for general life.

Burnett: [00:37:36] So because of your life experiences, you saw the one aspect of a totalitarian system: you are inside or outside. And if you do not like that system and you act against it, you are punished and you could not participate in that system. You did not want to, even if it meant that you could have had a career that you loved, that you wanted.

Fojtíková: [00:38:16] Yes.

Burnett: [00:38:18] So that was hard, but you made the decision and Professor Černohorský helped you decide what you already wanted inside, and gave you the opportunity to reflect and make the decision that was appropriate for you.

And so there was another life. He himself was a kind of outsider. He did not want to join the Party either and had experienced being outside of and inside of systems that he did not feel were very good systems. So he said, there's another path, there's another way, and you will be okay and you will be happy. So that was an impact on your life, I think. Why don't, don't we pause for now and we'll continue again next session.

Fojtíková: [00:39:20] Okay.

[break in audio. Interview resumes May 21, 2019]

Burnett: [00:39:31] This is Paul Burnett interviewing Dr. Fojtíková for the Czech Physics Project, the Martin Černohorský Project. And it is May 21st, 2019 and this is our second session. And when we stopped yesterday we were talking about a fateful decision not to join the Party and the understanding that there would be consequences for this and that you accepted those consequences and decided on a career outside of the university, but very connected to science and research. And so you had a short period at one institution and then established yourself at the Institute of Scientific Instruments. When did you start there and what was the work that you were doing?

Fojtíková: [00:40:51] Yes. It was something different from my university studies, but I had to accommodate myself to a new situation. And if you are young, you are flexible enough. And so I started to do what was necessary to do within the group I was in. And the head of the group was Professor Komrska. You communicated with him yesterday,

and so it was an interesting time, but not only positive, not only from the point of view of work, but from the point of view of the whole situation.

And so I was involved in a specific part of physics, and it was electron microscopy, specifically electromagnetic lenses, and I did some computations and created a catalog of specific lenses with specific properties and demonstrated the properties of these lenses on such images. At that time, it was not as easy as it is today because there were no such computers at that time. So there was much intellectual work to think of the whole system. I cooperated with other people who are educated in computer sciences. The work was very good.

[00:43:38] I also cooperated with one professor from Birmingham, from Aston University [United Kingdom], Tom Mulvey. And it was a very, very nice time for me because of course I could see that I was not allowed to be at university, so I am somehow the second-class part of society and that I didn't think of any higher career. And that time was very nice because this Tom Mulvey told me very often, "Maria, you are such a clever and skillful person. You must do it." So everything looked quite good, but at the end when my work was completed, of course, at that time I also wished to obtain a PhD degree. And, one day, I was prepared. I was in one room with two young colleagues, boys. And I had taught them some parts of physics and also English, because it was a necessary condition for this exam. And we three were prepared to go to the commission to start with this PhD studies, this *Candidatus scientiarum*, CSc. And we were all prepared, well-dressed, and went to the commission. And these two boys were asked to go inside. And one man came out of the room and came to me and told me, "Please wait."

[00:46:30] So I went to my work room, and later they informed me that I could not start this procedure because I was not active enough. I was not a member of the Communist Party. And it was funny, because we, we used to say that these party members are red people and that I am only pink. Yes? And you can imagine that I was really sad, but I said to myself, "Thank you, I will never knock on the door and ask these terrible people to allow me to do it." And what was nice was when these two boys came back and they both were accepted, they told me, "We are very sad what happened. We would prefer to tell them also, 'no thank you,' because we both know that you are much better than we are. And it's not correct." But it, it was life.

Burnett: [00:48:12] What year was that? When did this happen?

Fojtíková: [00:48:18] After that, I continued in normal work, tried to do it as well as possible, and was also active within the Union of Czechoslovak Mathematicians and Physicists. And it was also my answer when they told me that I was not active enough. I told them, "I think I am active enough within my primary profession." I suppose it was the best way of life of a person of my type. I cannot do any politics. I think that it's much better to be active in this [other] respect.

Burnett: [00:49:18] Can I ask you, for audiences who are not familiar with this world, what does it mean to be "active" in the Communist Party? What do you have to do to be, to participate fully, to be fully "red?" What do you need?

Fojtíková: [00:49:39] Yes. Paul, you might be surprised, because I never talked about this. So I know many, many people who maybe think that I was not able to do such a

career. And it's very interesting if I meet with somebody who I knew 20 or 30 years ago and we start to think of life. And they feel somehow ashamed. Yes? If they are sensitive enough and they never thought about it. Yes? If they were in another category, they didn't think of people like me. Because they, they supposed that I was probably not clever and skillful enough, so I was not able to do it. Yes.

[00:51:06] Dealing with the Party, I remember from the time that of course, young people had to participate in meetings. It was for example, at this Institute of scientific Instruments, which belonged to the Czechoslovak Academy of Sciences. So there were frequent meetings. And I don't know what it was about, but I know that these members of these so-called groups at your working place, groups of physicists belonging to the Institute. And there were other groups, and mostly directors of this Institute were party men as well. And, what was funny is that chairmen of these Communist Party members' groups were mostly normal working class, because in such an institute was also, I don't know how it is in English—not workshops, but if you needed to—

Burnett: [00:52:58] There were workshops. There were, there were technicians who built things, built equipment.

Fojtíková: [00:53:0] Yes, yes, because in this institute these lenses were made, things like that, parts of microscopes and so on, because it was a workplace with many experiments. And I remember a man, so dirty with a black color on his hands, he was almost the most important person. The most important person was one woman who was, now these offices are for personal things. And at that time, I don't know whether it has an equivalent in English: *kádrovat* [cadre].

Burnett: [00:54:17] A collective? Cadre?

Fojtíková: [00:54:21] These were the people who looked on people at the Institute to behave in a proper way.

Burnett: [00:54:34] Observers.

Fojtíková: [00:54:36] Observers, but oriented in this direction, connected with the Communist Party.

Burnett: [00:54:45] Yes. I understand.

Fojtíková: [00:54:45] If you were—and they were also asking some groups which were created for example in the region where you lived. Yes? So they asked neighbors, “Does she behave in the proper way? Isn't she doing something against the regime?” So terrible. And of course, they also saved some documents. If something appeared which was written about you, what you were doing, somewhere they saved it [in a file]. I'm sorry I didn't ask them in 1989 to give it to me, because I was too proud a person as I didn't want to [be in] touch with them. But it's a mistake, because they liquidated all the documents which were saved for some people. So these Communist Party members had to go to these meetings. They had to be active; they had to train “young pioneers,” so it was necessary to be active at home, to organize other people in the place they were living and so on. But they had one advantage, and I think it was the main reason why most of these people decided to become party members, not because they were communists at heart, but

they were allowed to travel abroad. And of course it was a big advantage in comparison with people such as me. And after the Velvet Revolution, they were silent for a while, but step by step, they started to appear again, and now you could meet many such persons who could remember quite well who you are and who you were, but who are now in some good positions again.

Burnett: [00:58:11] So let me reflect on what you said to make sure that it's accurate. What I understand is that the Party was totalitarian. It means that it's a total system of participation where there are community committees at work, at home, in your neighborhood, in your town, and so the idea of the system is that there is no outside of the system: everything is inside. And if you are not inside, you are possibly a danger to the system.

Fojtíková: [00:59:07] Yes.

Burnett: [00:59:08] And so they worried about that. And so they wanted to, everyone observed, there were particular people who were observers, and I think in Latin America, in the communist or socialist regimes is *intervedores*, and they were Watchers [interveners]. They watched people to make sure they did not behave [incorrectly]. And the work of the Party was community building, youth instruction, and making the right statements, quoting Lenin. And so, was it like that, where people were making, "Comrade, as Marx said, 'workers of the world, unite!'" these phrases. It was a way of reinforcing the communist community, and for you it was a problem because you had from a young age seen a bad side or several bad sides or consequences of this activity of the Party and you were not enthusiastic? You were not plotting actively at that time against the party. You were not organizing a secret meeting at that time. You wanted to be a scientist, to do your job as a scientist. And you did not want to be active in this community.

Fojtíková: [01:00:49] Yes, but it's mostly true. Surely, I didn't wish to be an active person in politics or act very openly against the regime. But I wanted to say that, it's, of course, my view. I can imagine, and I know, that many, many other people were more or less satisfied that they could do their jobs. There were no terrible accidents. Yes? These institutes of the Academy of Sciences were relatively quiet places, but it required some kind of adaptation to these conditions. And it was not my case. I could feel all the time. And of course, if I could communicate for some time with Tom Mulvey, these discussions were very open, and we visited also some people from the former DDR [*Deutsche Demokratische Republik*] as East Germany. And it was funny, because they tried to buy something that was not [available] in Germany in our country, and brought to us something from their country.

[01:03:00] So we were active enough to receive some good information what was happening. And, thanks to professor Černohorský, when I was a student, I remember that I once went to some consultation to him. His door was all the time open. He told us in his lectures, "you can come any time with any problems." And not everybody understood it well. And I was courageous enough when I had some troubles with problems in physics, I visited him. And at the end of our professional discussion, he put on the table one samizdat and asked me, "Do you know what it is? Did you see something like that?" And my answer was no. And I look at it and I could realize that professor Černohorský is from

somebody very exceptional, because he was active in this respect, being a perfect teacher and devoted to us much time.

[01:05:00] So thanks to his lectures, I feel now, of my behavior in other fields, these are consequences of this good education in the first year of my university studies. He was also head of my master's diploma work and of this *Rerum naturalium doctor*. And he was also head of the group of physicists I was in. So, I don't think that there was any other student who would do the same as I did. I had never asked them. Yes. If we meet now, you can see that everybody is different. Many of them are satisfied with everything that was before 1989 and what is now, and one must be careful not to be too strict in any evaluation, because you can never know what was happening in a family, because there are many people who were not allowed to study at secondary school. So it was my trying to reply to your question, dealing with activities. So, I don't know how anybody else might see it?

[01:07:00] But now I think that it was very important for me. I felt from that time on much better, and I started to be helpful in it [samizdat work]. We translated books by Albert Einstein *Out of My Later Years*. And it was not allowed to be published officially because he stated something against Lenin. But very irrational thinking. So it was the work of professor Černohorský who decided to translate it. So I participated, and the first samizdat was a book by Erwin Schrödinger, the Nobel prize winner from 1933. And the title of the book is *Mind and Matter*, and *What is Life?* But the first samizdat was this *Mind and Matter*, and we translated it. Most parts I translated, one part by Professor Komrska, and of course Martin Černohorský as well. And it's a fantastic book. It was written in English. So we translated it into Czech and after the Velvet Revolution, it was prepared as a whole double book. It was *Mind and Matter*, and *What is Life?* And this part *Mind and Matter*, we decided after the Velvet Revolution to publish it officially. So this part *Mind and Matter* was somehow prepared and Martin Černohorský also translated *What is Life?*, and it was necessary to check also this part *Mind and Matter*. So I could take it with me to show you the second edition as it was recently published. So these were activities and you probably heard about Ernst Mach's celebrations, and so I had organized with Professor Černohorský this on his native house [birth place].

Burnett: [01:10:19] And that was before the Velvet Revolution.

Fojtíková: [01:10:21] That was before. Yes, it was 1988. Yes. It was by the Union of Czechoslovak Mathematicians and Physicists; now it's the Union of Czech and Slovak because we are two countries. And it was a very, very interesting, these meetings are very interesting because—you know about Jan Fischer, who was active in informing Czech physicists about Georg Placzek. And for example, Professor Paty, and these men were very active somehow within these terrible boundaries, very active as Professor Černohorský. So it was so nice to be at any conference of Czech physicists, organized by this Union of Czechoslovak Mathematicians and Physicists. And what was nice that Professor Černohorský took, any time [he attended], a whole suitcase full of samizdat, and he spread it among these physicists and they continued. So I think it was a very good place for activities of these educated people and scientists.

Burnett: [01:12:17] I have so many questions. The first part of your story, part of the pain, I think of the situation around the Party, was feeling alone. Did you feel alone when you were refused the candidacy for the doctorate?

Fojtíková: [01:13:03] Okay, I cannot say, I think that it was something like my inner decision to do something useful. If I cannot be on a level of Marie Curie, I decided to prefer to be useful—I can imagine that it could sound stupid, but it's because of my English—something to do for our society to improve the whole situation because I believed that it must be changed. I couldn't live in this regime. Maybe, I don't know. I didn't feel for immigration, for example, but I know that I started to be somehow more active. And maybe we could even feel that a situation is changing in the 80s. But you must imagine that many people asked to become members of Communist Party even in 1989, when it seemed to me. [01:15:00] I don't know, I saw that something would change soon. And in 1989, it was on the day of my birthday, 29 of June, I was in Prague, and one physicist gave me a declaration called "*Několik vět*" in Czech: "A Few Sentences." Yes? And it was like a petition and it was necessary to sign it. And of course, it was against the regime: Please release Vaclav Havel from prison; we would like to have democracy, and so on. I don't remember it exactly. And it was a very interesting time because I decided to spread it in Brno and in my Institute, I was there at that time and Professor Černohorský and other people did the same. And I am surprised maybe now that I was at that time so courageous that I went to some concrete people at the Institute. [01:17:00] I know, for example, there was a brother of one actress, Vlasta Chramostová, in the Czech Republic, a well-known person, very active against the regime who was arrested also, and her brother. I don't remember his first name, but his surname was Chramosta, and I said to myself, he is a brother of Vlasta Chramostová; he will surely sign it and—maybe better without these names. But we can delete it later. I don't know whether he's still alive. And so I am, I am sorry. I am now with concrete emotion, and he told me, "Look, Vlasta told me not to sign it." And my answer was, "I don't believe that. I am sure Vlasta is for it." And other people didn't want to sign it because they were afraid—of course. There was, after that, much noise and people had troubles. I was very proud that my name appeared in [Radio] Free Europe. [01:19:00] It was a radio show, and we were listening to Voice of America: *Hlas Ameriky – Videň*. Vienna. So we were listening to this station and also to [Radio] Free Europe, and when I was listening to it, the radio said, "This petition was signed by these people ... Marie Fojtíková." So I was happy, and it was clear that there would be troubles soon, but there was not time enough because it was shortly before 17 of November and everything was different.

Burnett: [01:19:55] Yes, yes. So the impact, going back to the moment when Professor Černohorský put the samizdat on the table.

Fojtíková: [01:20:12] It was a very important moment. Sorry, I have interrupted.

Burnett: [01:20:19] You didn't, I want you to continue. I won't ask further: Tell me about the meaning of samizdat. What did it mean to have a connection like that after your experiences with the Party and all of that?

Fojtíková: [01:20:47] Yeah. It's interesting because the word, samizdat, is from the Russian language: *samostajatelnoje izdatel'stvo*, is in Russian. And so I think that it was part of the protest, that the name of it was a shortage [portmanteau] of these words. It means books which were produced by our own hands at home, typing on mostly mechanical typewriters. And it was possible to make at once twelve copies of such very thin paper using this carbon paper. Do you know? Carbon paper for making copies. So, for example—maybe it would be too long because I could get too detailed—but for

example, we prepared in this way: Professor Černohorský typed it and I made the covers to be more artistic and aesthetic. And these were for example poems by one Brno poet, Jan Skácel. His words are on the main square, a very nice person and I went frequently to his home and he signed these books. So I have at home some of them. And so it was one possibility, and another one was to—we changed it somehow—if I received some books from somebody, I could lend it to somebody else and so on, and Martin Černohorský used this big luggage to spread it among physicists. And I, I think it was very important because these are books which we're not allowed to be published officially in the Czech Republic. Also some books by Karl Popper. I met with him at Charles University in 1994, and it was fantastic. I think he was '94 or something like that, at that time. And with his assistant, she was very strict. She didn't allow other people to disturb such an important person. And I had with me all his books I had from samizdat, and I was courageous enough to get close to him. And the woman told me he has no time. And when he saw that I had something in my hands, he asked me, "Who are you?" And I showed him the samizdat, and he was so surprised and so excited by this. I never saw, Oh, it's wonderful! And I had prepared my pencil and I asked him whether he could sign it. Of course he did it. So I think that there is also some document at Charles University [video] how I am communicating with Karl Popper.

Burnett: [01:25:31] Wonderful. Well, so my interpretation of your story is that when Professor Černohorský showed you the samizdat, and you understood that there are other people who also feel the same, who also feel the pain, and you do not feel alone. You do not feel alone anymore.

Fojtíková: [01:26:01] Yes.

Burnett: [01:26:02] And that was personally powerful for you.

Fojtíková: [01:26:05] Yes.

Burnett: [01:26:06] That you feel a connection. And then with samizdat, you are typing each word, and you are reading these books closely because you are typing them.

Fojtíková: [01:26:22] Surely.

Burnett: [01:26:23] And, and it's forbidden knowledge. You're not allowed to know this knowledge. So it, it's—

Fojtíková: [01:26:34]—special.

Burnett: [01:26:35] It's very special. It's funny, for me, because Karl Popper is not a, well, Albert Einstein is not an anticommunist ideologue.

Fojtíková: [01:26:58] Yeah.

Burnett: [01:27:01] Karl Popper has a reputation in the United States. But it's, hard to appreciate how this is seen as such a threat to the state, such a threat to communism that people can read *What is life?* or something, you know.

Fojtíková: [01:27:29] Yes.

Burnett: [01:27:30] It tells me just how much control—just how much insecurity and danger was felt by the members of the Party: The need to control what people see, what people read, what people say, what people do. It's a powerful story about what the people of Czechoslovakia at that time were living.

Fojtíková: [01:28:05] Yes.

Burnett: [01:28:05] And you're just trying to be a scientist. You're just trying to be a scientist and to live your life.

Fojtíková: [01:28:11] Yes. I wanted to tell you that it can look maybe more important than it was. I would like to add that, of course we normally worked, continued in our work and it was something more, and nobody who wasn't involved knew about it. And it was interesting that after the Velvet Revolution, I was surprised that, it's not so interesting and important for people who somehow liked this life [under communism] without any problems. But I could just say that there are many people who lost their jobs, their children couldn't study, and so on, and were arrested. So, when I realized that in the whole complex, I said to myself, I cannot be absolutely silent.

[01:29:40] So at least within—it was not only physics, as I told you that we also made these poems, but we tried within these communities of physicists and mathematicians to do something. And I have not time enough to talk about all of these conferences and seminars we organized with Professor Černohorský and these were very famous. And that's why Professor Černohorský is such an important person. Everybody admired him, because he was very courageous and within these conferences and seminars, he was doing these activities. Also, these materials from these conferences were on the level of samizdat. He didn't ask anybody whether they were allowed to publish it, and he wrote that "These are working materials of the Union of Czechoslovak Mathematicians and Physicists, and you cannot say a word." [laughter] I hope you can understand that. Yes?

Burnett: [01:31:36] And so the samizdat materials would be circulated, and you could meet to discuss Schrödinger, you could meet to discuss Einstein, and so it was not just reading, but it was also discussion.

Fojtíková: [01:32:00] Yes, of course. It was also very nice. Some meetings were in a flat or the apartment of Professor Černohorský. He invited some other people who were involved in these activities. And we were discussing, and other people invited also—there was this foundation, The Jan Hus Foundation, and the beginning of it comes from France, and so one family who lived in the same house as Professor Černohorský, Professor Jelinek. He was first rector of Masaryk University after the Revolution, and he was a very good in French, his wife as well, and he had many friends in France, so they invited scientists from the humanities and from all branches. We had more or less such discussions, not experts, not only talking for talking, but on some topics, yes? And of course, always, one topic was: what is the situation like in the Czech Republic and what they can do for us?

[01:34:00] Again, I was not an organizer of these meetings, but when, for example, I invited somebody, these were mostly physicists, but of the same orientation. So we were discussing many, many topics and also with people who were connected. That were some

authors of these books and they were happy that we were able to spread it, and very surprised, as you are, that it was not allowed to publish a book by Schrödinger or Einstein. Unbelievable.

Burnett: [01:34:56] And were there Czech authors as well that were circulated in the Samizdat? I mean, I, of course there were, but within, within your group? Havel?

Fojtíková: [01:35:11] Yes, yes, there were also Czech writers, for example, Ludvík Vaculík, also of course some books by Václav Havel, and after the Velvet Revolution you know that Václav Havel was the first president. And at that time, in 1993, I was involved in the Czech Rectors Conference and he invited all the Czech rectors to one place and a wonderful discussion. And of course, I was part of it and I had again with me all his books, samizdat, and it was very nice. I think that probably nobody took any photo of these proceedings. It was a big day because he was similarly surprised—not surprised, because he of course knew about samizdat, but he was happy that I had so many of his books and I asked him to sign them. And you can imagine that among the rectors were people who were more comfortable with the [old] regime, so I felt that I could communicate with the Czech president on the proper level.

Burnett: [01:37:11] Wonderful.

Fojtíková: [01:37:12] So yes, there were books and also newspapers that were published. There were many interesting and also funny stories because somebody thanked me for this samizdat newspaper, that I am a great person, that I spread it and that she could read it and she was talking about it at some normal meeting. And I told her, “Don’t talk too much about it.” [laughter] What was nice was that she was probably not afraid.

Burnett: [01:38:03] Interesting. I heard that, there was a famous speech by Václav Havel, and it was a recording, or something, and you transcribed this and circulated it. The point of the story is that you were so dedicated and involved that you were able to distribute information almost immediately, that you were very effective in your work, because I imagine when the change was coming, it was coming slowly for many years. When was the first samizdat? When was that meeting with Martin Černohorský? What year?

Fojtíková: [01:39:07] I started my university studies in 1973 so I think it was not this year, but maybe ‘77. There was a movement—

Burnett: [01:39:48] Charter ‘77.

Fojtíková: [01:39:51] Yes. So surely, surely it was before this. I was ‘74 when I could see the first samizdat and maybe I was the most active after finishing my university studies, dealing with these samizdats. So it was more in ‘80s. Yes?

Burnett: [01:40:28] Yes. I think the repression of the state produced its own enemy, because it was the alienation that you felt from the surveillance, from the pressure, from the exclusion from the Party, it generated your disgust and your animus against the Party. It was almost entirely a product of the behavior of the party, and it’s, as you said, it was something that was less visible. To those who behaved “well,” according to the Party, it

was only visible if you saw someone cross the Party. If you were perceived to do something against the party, then you would see the real face of the Party.

Fojtíková: [01:41:37] Yes.

Burnett: [01:41:39] It's a long period. It's 1975, '76, '77, until 1989, this long period of a second community.

Fojtíková: [01:41:58] Yes.

Burnett: [01:41:58] A community outside of the state, but a community of scientists and mathematicians who also had a humanistic community devoted to talking about change, talking about the fulfillment of their humanity, and reading humanistic sources by scientists or poets or whoever. So you all survived that period and the Velvet Revolution happened in part because of the work of scientists and the story that we hear outside of the Czech Republic, the phrase is the "poet's revolution." And what I find so interesting is that it's also a scientists' revolution and a mathematicians' revolution.

Fojtíková: [01:43:10] Yes.

Burnett: [01:43:12] There were many people of different occupations and different vocations and passions who were opposed to the communist regime and, and who wanted democracy and wanted change and a new life for the Czech people.

Fojtíková: [01:43:29] If I can I would like to add that I am not aggressive or very—

Burnett: [01:43:41] An ideologue.

Fojtíková: [01:43:43] But it's clear for me, for my inner [conscience] what I would like to do, what is my style of thinking and what are my priorities. But I know that time goes quickly. And if I have some time to think of it, I have no very negative feelings to persons who were involved there because it would be a very difficult. Of course, among physicists, there were many persons who were in the Communist Party. And it doesn't mean that these were terrible people. If you don't know all the details of somebody's life, you can make no judgment. So I am more or less a happy person, and of course I can see what is happening now, but I don't want to spend my life complaining, and I am trying to do something positive if I can do it.

Burnett: [01:45:34] I want to talk a little bit about the Czech Rectors Conference. You are today the Secretary General of the Czech Rectors Conference. Martin Černohorský in his oral history has talked about the foundation of the Czech Rectors Conference. Can you talk about your role in the Czech Rectors Conference and a little bit about its history?

Fojtíková: [01:46:04] Yes, I will try to do it. So I have been there since the beginning, since the very beginning. And even a short time before. There was in Czechoslovakia created after the Velvet Revolution the so-called Club of Rectors of Czech and Slovak Higher Education Institutions. And, I have mentioned Professor Jelínek who was the first Rector of Masaryk University. And at the time, Professor Černohorský decided or wished he could be the Rector of Silesian University in Opava. But at the time of this club, he wasn't [at the position of rector]; he was, a little bit later. So they decided in March 1992

to create a Secretariat out of this club, and because it was in Czechoslovakia, they decided to put it in Brno to be between Slovakia and the Czech Republic. Professor Jelínek supported it and Martin Černohorský, who wasn't that time Rector, because he was a friend of Jelínek, he was helpful in creating the Secretariat. So, not only him, but he also knew me from samizdat, and he talked to me. He would need some person who could start with this work. "Would you be prepared to do it for some limited time, maybe half of a year or one year?" And so they publish some selection procedures, *konkurz* in Czech.

Burnett: [01:48:57] Competition?

Fojtíková: [01:48:58] It was a created commission and there were more applicants and I was one of them. So it was very correct. They didn't say, "It has to be Marie." But they decided for me and it was not an easy decision for me because at that time I was at this Institute and my work didn't look terrible, but—you could be also interested in it—I was active in publishing all the documents which were created at this Institute in these days of revolution. I was one of the most active people.

Burnett: [01:50:01] You were the editor in chief.

Fojtíková: [01:50:02] And it was my idea to gather it and to save it for the future. So it was something different. This booklet exists with all the statements of people who were at this Institute. It would also be some independent story. And so it was not too easy for me, but at the same time, I could notice how probably, it surely much better than me from history, that during the revolution, some people are good enough to do it, and after that others would like to be in some positions. And fortunately I could see it very clearly that when it was clear that the regime is overcome, other people started to be interested in organizing everything in the Institute. So it was a relatively good time for some change.

But I said to myself, I don't know whether I will be able to do something like that. I would prefer to be involved in physics, but because as I said, I was decided in my inner [conscience] that it is necessary, I think that my mentality is the same: again, it's important to do something positive. It could happen that—processes hopefully are not reversible completely, but partly, yes. It could happen that something terrible could appear again. Of course, Martin Černohorský was also active in it. He told me, "Think of it; it could be nice. You could do it. They are not able to do it by themselves." And there were among Rectors other physicists who knew me from physics and they all told to me to try it and so on. So I did it, and I won.

Burnett: [01:53:28] You won.

Fojtíková: [01:53:29] The competition, yes.

Burnett: [01:53:32] You were hired.

Fojtíková: [01:53:33] In this position. Yeah. And so, so I was Secretary General of this club, and in January 1993, thanks to Professor Černohorský the Czech Rectors Conference was created. And from that time, I have been the Secretary General of the Czech Rectors Conference. I created statutes, not only me, but of course somebody must draft it. And we had many discussions with Jelínek, Černohorský, and other people. And so I had in my office my own typewriter, also this mechanical one, and so I contacted a

company dealing in computers, and they gifted the Czech Rectors Conference a computer. At that time no emails were used in the Czech Republic, but because I was from physics and mathematics, I was familiar with all this new equipment. It was a funny situation. I wrote all the rectors a letter, “Please send me your email.” And many secretaries of rectors called me, “Please, could you tell me what it is?”

Burnett: [01:55:38] So you were at the beginning of something important. Were you concerned in drafting the statutes? You’re building the structure of the Czech Rectors Conference. Were you concerned about governance and democracy within the Czech Rectors Conference? Did you think about—want to create a system that is less vulnerable to this reversibility that you talked about, reversing back to a communist system of control, direct control? Was that a concern for you?

Fojtíková: [01:56:28] Absolutely, yes. It was the main idea to be helpful in creating something democratic and good in its sense. So I know that up to now voting rules are true within the Czech Rectors Conference. And there are sometimes also funny and interesting discussions: “Marie, wouldn’t it be better to make it more simple?” And my answer is always no, I don’t recommend it. It’s such a clever system and everything is connected with everything that you can be sure if you use it or go through it, you will follow these rules. You can receive the best results, the most democratic. No one has power above the selected people. Everybody can choose what he or she wishes to stress.

Burnett: [01:58:16] Did this extend, because I understand part of your role as secretary general of the Czech Rectors Conference is to interact with similar people in other countries of the European Union. So this is now later, after 2002, 2003, the European Union is established, of which the Czech Republic is now a part. Did your democratic impulses also translate to the world of the European Union?

Fojtíková: [01:58:55] Yes. The name of the association is the European University Association. There are individual full members. These are individual universities. For example, from the Czech Republic, there are eighteen universities that are members of this association, and also the rectors conferences are so-called “collective members” So the Czech Rectors Conference, I hope that it’s also thanks to me, the Czech Rectors Conference is now a full collective member of the European University Association, and the Czech Rectors Conference has one representative rector. Mostly these are presidents of these conferences. In the Czech Rectors Conference, the president is now the rector of Charles university, and he is such a busy person that he postponed [delegated] his position in this association to another rector. It’s now the rector of Masaryk University who is the representative of the Czech Rector’s Conference. And the body within this association is called a European University Association Council. So there are maybe twenty-five or more – the European Union has twenty-eight members, so approximately thirty rectors sitting around one the table, and mostly all secretaries general. But I have no voting rights. So the secretaries general are all observers, but if they are active enough, intelligent enough, diplomatic enough, have a good behavior, they can do many good things.

[02:02:33] So I am trying to use my position for these discussions and so on. So there were, I think from that time, from 1993, in the Czech Rectors Conference in the Czech Republic, there were about three times big conferences of this association. And it’s necessary to plan it for a long time and it’s with very many participants. And it’s

necessary to work on it, to explain to people for example, to the president of this association that Charles University would be happy if it could organize the conference, whether it would be possible in 2009, when the Czech Republic was a leading country of European Union, and it worked. If you start to work on it two or three years before, you can succeed. And of course, I could also influence such procedures like voting for a new president of this association and new members of both. And I remember that it was used to be chosen only from one candidate.

Burnett: [02:03:39] It was just a nomination and appointment?

Fojtíková: [02:03:41] –nomination, yes. Once, I was openly surprised. Of course, we could have some comments and so on as secretaries general. So I asked a question whether it would not be better to do it in this way, to have more candidates and really have an opportunity to vote, that we enough experience from our socialistic times and that I am surprised that something similar could happen here in—

Burnett: [02:04:38] the European Union—

Fojtíková: [02:04:39] –in the European Union. So it has really changed now. There are normal elections from more candidates.

Burnett: [02:04:53] What I'm hearing from your stories and the stories of the other participants in this project is that it is not enough to be your profession, you're a scientist; it's that you must have integrity in your behavior, and you must think critically about the world that you live in and act with others, discuss with others about how to improve it.

Fojtíková: [02:05:33] Yes.

Burnett: [02:05:34] And that that's part of whatever you do. And I think about the message for the young people of the Czech Republic. Do you have advice, because many young people today, from today on – some of your employees were born after the foundation of the Czech Republic. They do not know about samizdat. They do not know about the Communist Party. They do not know directly that history. So do you have any counsel or advice for the future generations of the Czech Republic?

Fojtíková: [02:06:26] I think that it is important to think about priorities, what is important, what not. Be open enough to others. Listen to other people, understand them, and don't be afraid about your own position. It's not so important; what is important is what you can do for the society and for other people. And it's not that important whether anybody knows that it was you who did it. What is important is that something positive has happened. And I think that education in mathematics and physics is a very good preparation also for such a job as secretary general. I had since the beginning, so many people who I knew from Academy of Sciences, from universities, that it was easier for me to communicate with them. And up to now I have really no problem in communication, for example, with the minister of education and with the president of this European University Association, because I hope they all know that I am a person who is thinking about everything and is not doing any exhibitions and things like that.

Fojtíková: [02:08:54] Paul, could I add just one short comment I would like to mention in my interview? If we have a few minutes about Placzek. I would be sad if I couldn't

mention that in 2005, we organized here in Brno a symposium devoted to George Placzek who was born in, as you know, in 1905 and died in 1955. And his nephew, Tony Placzek, visited Brno and participated in the conference. And from that time we have a wonderful relationship with Tony Placzek, with his family, and he was very helpful to Brno mathematicians and physicists in creating this George Placzek scholarship for young students of physics who finished their secondary school studies and who are accepted at any university for physics studies. And I am also very grateful to Tony Placzek that you that I could meet with you. I thank you very much. You are perfect wonderful person with wonderful English. I am sorry my English is so poor that it has no comparison with yours. But I have very nice feelings that you can understand everything, so thank you very much.

Burnett: [02:11:18] Thank you. I think it speaks to the Placzek project, the plaque project for Georg Placzek in the square in Brno and the [Ernst] Mach plaque. There is, for Martin Černohorský and you and others, an interest in history, the history of science in this region, in Czechoslovakia and the Czech Republic. And I imagine that it is part of a healing process of reaching back into history to find the good parts and the bad parts, in order to move forward in Czech history. And I think that's what's been so powerful for me interviewing you and Professor Černohorský and in working with Tony, that there is this reunification of these wonderful elements of this part of the world. I'm very grateful to have been a witness to that reunification.

Fojtíková: [02:12:35] And Paul, a final comment. You were asking me to say something for a young generation. I think what is very important is the collection of anything, to have it for the future. From history, I consider it very important. That's why I am taking photographs, being at these events of the European University Association, and if you are here in Brno, or Tony or anybody else, I think that it's important to have documents of the time. And so I admire your work very clearly very much. It's no phrase. Yes? I like history and historians very much. And it is wonderful your oral history stories. Thank you. It's the best for a young generation.

Burnett: [02:13:55] I hope so.

Fojtíková: [02:13:55] Yes, I am sure.

Burnett: [02:13:58] Thank you very much.

Fojtíková: [02:13:59] Pleasure.



Martin Černohorský and Tony (F.A.) Placzek, Brno, 2019